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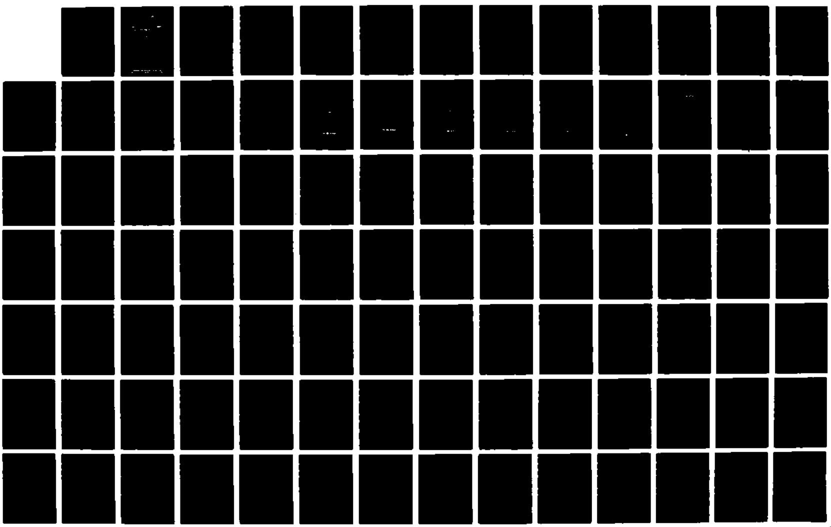

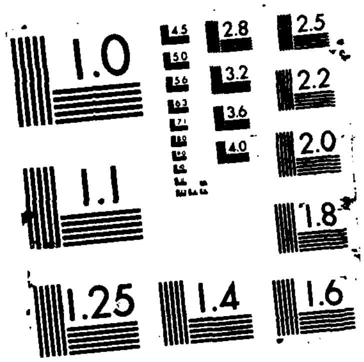
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1986 CRC OCTANE NUMBER REQUIREMENT SURVEY

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1986 CRC OCTANE NUMBER REQUIREMENT SURVEY

(CRC PROJECT No. CM-123-86)

Prepared by the

1986 Analysis Panel

of the

CRC Octane Number Requirement Survey Group

August 1987

Automotive Vehicle Fuel, Lubricant, and Equipment Research Committee

of the

Coordinating Research Council, Inc.

ABSTRACT

In the fortieth annual statistical survey of current model vehicles conducted by the Coordinating Research Council, Inc., test data were obtained on 377 1986 model vehicles, including 314 US vehicles and 63 imported vehicles. Sixteen laboratories participated in this Survey. Maximum octane number requirements were determined by testing at maximum-throttle conditions, as well as at part-throttle. Requirements are expressed as the (R+M)/2 octane number, Research octane number, and Motor octane number of the reference fuel producing knock which was recurrent and repeatable at the lowest audible level. The primary analyses used in this report are based upon (R+M)/2 octane number requirements, rather than upon Research octane number requirements as in Survey reports prior to 1985. Estimated octane number requirements for the US vehicles are weighted in proportion to the 1986 vehicle model production figures and, for the imported models, in proportion to import sales volume in the United States.

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TEXT

I. INTRODUCTION

In the fortieth annual statistical survey of current model vehicles conducted by the Coordinating Research Council, Inc., test data were obtained on 377 1986 model-year vehicles, including 134 knock sensor-equipped vehicles and 6 select models of special interest. Two of the select models were equipped with knock sensors.

Passenger cars and light-duty trucks including vans were tested to represent the 1986 vehicle population in the United States. This year's Survey includes analyses for the following vehicle categories:

(1) US and Imported Vehicles -- 377 vehicles

(2) US and Imported Cars -- 306 cars

(3) US Vehicles -- 314 vehicles

(4) US Cars -- 250 cars

(5) Imported Vehicles -- 63 vehicles

(6) Knock-Sensor Vehicles -- 134 vehicles

It should be noted that the term "cars" designates passenger cars only, while the term "vehicles" includes passenger cars plus vans and light-duty trucks.

Sixteen laboratories participated in this Survey; they are listed in Appendix A. Members of the CRC Octane Number Requirement Survey Analysis Panel are identified in Appendix B.

II. SUMMARY

Data were collected on 377 1986 model-year vehicles. These vehicles consisted of 314 US vehicles and 63 imported vehicles. There were 250 US and 56 imported passenger cars. The remainder consisted of sixty-four US and seven imported light-duty trucks and vans. The 1986 Survey included sufficient data for six specific models which were analyzed separately as select models. All select models had automatic transmissions. The average deposit mileage in this Survey was 11,849. The weighted average engine displacement and compression ratio were 3.00 liters and 8.95, respectively. One hundred and thirty-four vehicles were equipped with knock sensors.

Requirements are expressed as the (R+M)/2 octane number, Research octane number (RON), and Motor octane number (MON) of the reference fuel which produced knock that was recurrent and repeatable at the lowest audible level. (This definition of borderline knock was used for the first time in the 1984 Survey.) Estimated octane number requirements for the US cars and light-duty trucks and vans are weighted in proportion to the 1986 vehicle model production figures and, for the imported models, in proportion to import sales volume in the United States.

It should be noted that the primary analyses used in this report are based upon (R+M)/2 octane number requirements, rather than upon RON requirements as in Survey reports prior to 1985. Full-boiling range (FBRU and FBRSU) reference fuels were the same as those used in the 1985 Survey.

Part-throttle requirements were defined when their requirements were higher than the maximum-throttle requirements or, with FBRU fuels only, when they were within four octane numbers of maximum-throttle requirements. The maximum requirements listed for the 1986 Survey were reported by the same method used in prior Surveys. The greater of the maximum-throttle or part-throttle requirement is used, except when both the maximum-throttle and part-throttle requirements are the same. In that case, the computer selects the part-throttle requirement as the maximum octane number requirement. Maximum (high-borderline) and minimum (low-borderline) octane number requirements were reported for the knock sensor-equipped vehicles when determined.

This is the fourth Survey in which requirements for knock sensor-equipped vehicles were included in the distribution. The base analysis case for this report uses the maximum (high-borderline) octane number requirements of these vehicles. The following table for FBRU fuels presents maximum 1986 octane number requirements and changes from 1985 for the six weighted populations, at the 50 percent and 90 percent satisfaction levels, as well as illustrating the effect of using maximum (high-borderline) or minimum (low-borderline) for knock sensor-equipped vehicles on these six populations. At the current market penetration levels, inclusion of the knock sensor-equipped vehicles at their minimum (low-borderline) requirement reduces the total vehicle population requirements relative to those calculated at their maximum (high-borderline) requirements by 0.5 (R+M)/2 at the 50 percent satisfaction level, and 0.8 (R+M)/2 at the 90 percent satisfaction level.

FBRU (R+M)/2 OCTANE NUMBER REQUIREMENTS

1986 AND CHANGES FROM 1985

Weighted Population	KS-H**	Δ from 1985	KS-L***	Δ from 1985
50% Satisfaction				
All US and Imported Vehicles (35.5%)*	85.3	-1.1	84.8	-1.1
All US and Imported Cars (29.1%)	85.0	-1.2	84.8	-1.0
All US Vehicles (39.8%)	85.5	-1.0	84.9	-0.8
All US Cars (33.2%)	85.4	-0.9	85.1	-0.6
All Imported Vehicles (14.3%)	84.6	-1.7	84.3	-1.9
All Knock-Sensor Vehicles	85.4	-1.3	83.4	-0.4
90% Satisfaction				
All US and Imported Vehicles (35.5%)*	89.8	-0.3	89.0	-0.8
All US and Imported Cars (29.1%)	89.5	-0.5	88.9	-0.7
All US Vehicles (39.8%)	90.2	-0.2	89.6	-0.6
All US Cars (33.2%)	90.2	-0.1	89.6	-0.4
All Imported Vehicles (14.3%)	88.0	-0.9	87.7	-0.9
All Knock-Sensor Vehicles	90.2	-1.3	88.6	-0.5

* Knock sensor-equipped vehicles as percent of the associated population.

** KS-H = Population with knock sensor-equipped vehicles at maximum (high-borderline) requirement.

*** KS-L = Population with Knock Sensor-Equipped Vehicles at minimum (low-borderline) requirement.

Maximum octane requirements for the select models at the 50 percent and 90 percent satisfaction levels for FBRU fuels are summarized in the following table:

SELECT MODELS

MAXIMUM FBRU OCTANE NUMBER REQUIREMENTS

Select Model	No. Tested	(R+M)/2 50% Sat.	(R+M)/2 90% Sat.
PKD T22A3/KKD T22A3/KED T22A3/ KHD T22A3/DCD T22A3	14	84.7	87.6
PKK T25A3/KKK T25A3/PEK T25A3/ KHK T25A3	12	84.2	87.0
ORU P30A4/MRU P30A4/ORU P30A3 (High-Borderline)	17	84.8	89.0
ORU P30A4/MRU P30A4/ORU P30A3 (Low-Borderline)	14	82.2	84.6
OPF P50A4/MPF P50A4/OSF P50A4	11	85.7	88.5
NAR T25A3/HAR T25A3/IAR T25A3/ LAR T25A3	28	88.9	93.5
ICB P38A4/IEB P38A4/LCB P38A4/ LEB P38A4 - (High-Borderline)	16	80.6	85.2
ICB P38A4/IEB P38A4/LCB P38A4/ LEB P38A4 - (Low-Borderline)	16	78.5	83.4

Incidence of part-throttle knock with FBRU greater than maximum-throttle knock has remained somewhat constant over the last three years. Maximum requirements occurred at part-throttle in 8 percent of all 1986 model vehicles with FBRU fuels (29 of 373 vehicles), compared with 10 percent in 1985 and 9 percent in 1984.

In the 1986 Survey, 31 percent of the weighted vehicle population knocked on tank fuel, which compares with 37 percent in the 1985 Survey and 49 percent in the 1984 Survey.

III. TEST VEHICLES

This year's Survey tested a total of 377 1986 model vehicles, compared with 374 vehicles in the 1985 Survey. The analysis of the data included 306 passenger cars (250 US and 56 imports) and 71 vans and light-duty trucks (64 US and 7 imports). Also included are 134 knock sensor-equipped vehicles (83 US passenger cars, 42 US trucks and vans, and 6 imported vehicles).

A sufficient amount of data (eleven or more vehicles) was obtained for six specific select models. These select models are described in Table I.

In the 1986 Survey, 84 percent of the transmissions were automatic. Fifty-six percent of the automatics were three-speeds, and the rest four-speeds. The manual transmissions were divided into fourteen four-speeds and forty-six five-speeds. Ninety-four percent of the surveyed vehicles were air-conditioned.

Table II shows the distribution of odometer mileage for both the 1986 and 1985 Surveys. The 1986 distribution is shown as a bar chart in Figure 1. The average odometer mileage was 11,849. Two vehicles with odometer mileages less than 6,000 miles were included in the analysis. The weighted average displacement in 1986 was 3.00 liters, compared with 3.16 in 1985. The weighted average compression ratio in 1986 was 8.97 compared with 8.81 in 1985.

The basic timing was adjusted to the manufacturer's recommended setting (within $\pm 2°$) prior to testing. A total of twenty-two vehicles were adjusted; seven were two or more degrees off from the manufacturer's setting. The number of vehicles and their deviation in spark setting are shown in Table III.

Participants were requested to rate specific vehicle models in a pattern which would minimize data bias due to differences among testing laboratories and vehicles. To accomplish this, the United States was divided into four geographical areas, and laboratories within each geographical area were requested to test specific vehicles.

IV. REFERENCE FUELS

Three series of reference fuels were used in the 1986 Survey:

- Primary Reference (PR) Fuels;

- Average Sensitivity Full-Boiling Range Unleaded (FBRU) Reference Fuels with sensitivities similar to those of normal commercial gasoline; and

- High-Sensitivity Full-Boiling Range Unleaded (FBRSU) Reference Fuels with sensitivities about two octane numbers higher than the FBRU fuels.

The 1986 FBRU and FBRSU fuels were the same as those used in the 1985 Survey.

A. PR Fuels

Isooctane and normal heptane, meeting ASTM specifications, were blended in two octane number increments from 76 to 82 octane number, and in one octane number increments from 82 to 100 octane number.

B. FBRU Reference Fuels

FBRU fuels were the same as those used in the 1985 Survey, and were prepared from three base blends (RMFD-356-85/86, RMFD-357-85/86, and RMFD-358-85/86) in two octane number increments from 78 to 84 RON, and in one octane number increments from 84 to 103 RON.

The base blends were prepared from normal refinery components. Inspection data furnished by the supplier are shown in Appendix C, Table C-I. The composition and average laboratory octane data for the 1985/1986 FBRU reference fuel series are presented in Appendix C, Table C-II.

C. FBRSU Reference Fuels

FBRSU fuels were also the same as those used in the 1985 Survey, and prepared from three base blends (RMFD-359-85/86 RMFD-360-85/86, and RMFD-361-85/86) in two octane number increments from 78 to 84 RON, and in one octane number increments from 84 to 103 RON.

The base blends were prepared from normal refinery components. Inspection data furnished by the supplier are shown in Appendix C, Table C-III. The laboratory blending octane data for the 1985/1986 FBRSU reference fuels are presented in Table C-IV.

V. TEST TECHNIQUE

The test technique (CRC Designation E-15-86, Attachment 2 of Appendix D) specified that octane number requirements be determined at level road acceleration conditions. The order of fuel testing was tank fuel, FBRSU fuels, FBRU fuels, and PR fuels. Knocking tendencies were investigated using both maximum-throttle and part-throttle acceleration techniques.* Part-throttle was investigated in each vehicle to determine if the part-throttle requirement was higher than the maximum-throttle requirement. In these cases, the part-throttle requirement search was conducted with all three fuels. Part-throttle requirements were also determined with FBRU fuels down to four Research octane numbers below the maximum requirement at maximum-throttle.

The maximum octane number requirement of a vehicle is defined as the (R+M)/2, Research, or Motor octane number of the highest octane test fuel producing borderline knock. This requirement is defined at either maximum- or part-throttle accelerating conditions. For vehicles equipped with knock sensors, the technique identifies the highest octane fuel that gives borderline knock (maximum or high-borderline requirement) and the lowest octane fuel that gives borderline knock (minimum or low-borderline requirement). Requirements are expressed as the (R+M)/2 octane number, Research octane number (RON), and Motor octane number (MON) of the reference fuel which produces knock that is recurrent and repeatable at the lowest audible level.

Of the sixteen laboratories participating in the 1986 Survey, four used level roads and twelve used chassis dynamometers. Seventy-five percent of the cars were tested on chassis dynamometers.

Average test temperature was 70°F, with a barometric pressure average of 29.83 inches Hg and average humidity of 58.23 grains per pound. Test conditions for individual observations are reported in Appendix E.

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* Maximum-throttle is either full-throttle for manual transmissions or widest throttle position (detent) that does not cause the transmission to downshift for automatic transmissions.

VI. DISCUSSION OF RESULTS

A. Distribution of Maximum Octane Number Requirements

The octane number requirement data were used to prepare satisfaction curves and tables for the following samples of 1986 model vehicles:

(1) US and Imported Vehicles,
(2) US and Imported Cars,
(3) US Vehicles,
(4) US Cars,
(5) Imported Vehicles, and
(6) US and Imported Knock-Sensor Vehicles.

Maximum (R+M)/2, RON, and MON requirements and 95 percent confidence limits for the six categories at 50 percent and 90 percent satisfaction are shown in Table IV. In preparing the curves and tables, the octane number requirement data were weighted in accordance with final 1986 model-year production data, and with US sales figures in the case of imports. Each curve and table, therefore, provides an estimate of the distribution of octane number requirements of the appropriate vehicle population on the road. The procedure for assigning weighting factors and for calculating the octane number requirement distributions is described in Appendix F.

Vehicles equipped with knock sensors were included in the 1986 models tested. All vehicles with knock sensors were tested for maximum (high-borderline) octane number requirements, and 119 of the 134 vevhicles were tested for minimum (low-borderline) octane number requirements. Octane number requirement distributions were calculated for each group of vehicles using the requirements from those vehicles with knock sensors rated at maximum (high-borderline) requirement and with their ratings at minimum (low-borderline) requirement. Maximum octane number requirements for the 1986 model vehicles were considered to be the requirements which included the knock sensor-equipped vehicles at the maximum (high-borderline) requirement.

Requirements are expressed as the (R+M)/2, Research, and Motor octane numbers of the reference fuel which produced knock that was recurrent and repeatable at the lowest audible level. (This definition of borderline knock was used for the first time in the 1984 Survey.)

It should also be noted that the primary analyses used in this report are based upon (R+M)/2 octane number requirements, rather than upon Research octane number requirements as in reports prior to 1985.

1. US and Imported Vehicles

In the 1986 Survey, maximum octane number requirements were determined on 377 vehicles with PR, FBRU, and FBRSU fuels. One hundred and thirty-four of the vehicles were equipped with knock sensors.

Maximum (R+M)/2 octane number requirements for all three reference fuels are shown in Figures 2, 3, and 4. Each plot compares the requirements with US and imported vehicles, including knock-sensor vehicles, with ratings at the maximum (high-borderline) level and the minimum (low-borderline) level. The maximum (R+M)/2 octane number requirements for all three reference fuels are plotted in Figure 5. The octane number requirement distributions for FBRU and FBRSU fuels are similar. Maximum (R+M)/2, Research, and Motor octane number requirements are listed in Table V. Octane number requirements with knock sensor-equipped vehicles tested at minimum (low-borderline) levels are given in Table VI. The 50 percent and 90 percent satisfaction level requirements are:

MAXIMUM OCTANE NUMBER REQUIREMENTS

(US and Imported Vehicles)

	50% Satisfied			90% Satisfied		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	87.6	87.6	87.6	92.9	92.9	92.9
FBRU	85.3	89.2	81.4	89.8	94.8	84.9
FBRSU	85.2	90.4	80.0	89.8	95.9	83.7

Differences between 1986 and 1985 Survey maximum (R+M)/2, Research, and Motor octane number requirements are also shown in Tables V and VI for all three fuel series. Distributions of the 1986 and 1985 maximum (R+M)/2 requirements are shown in Figure 6 for FBRU fuels. The differences at the 50 percent and 90 percent satisfaction levels are:

DIFFERENCES BETWEEN 1986 AND 1985 MAXIMUM OCTANE NUMBER REQUIREMENTS

(US and Imported Vehicles)

	50% Satisfied			90% Satisfied		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	-1.2	-1.2	-1.2	+0.1	+0.1	+0.1
FBRU	-1.1	-1.4	-0.9	-0.3	-0.3	-0.3
FBRSU	-1.0	-1.3	-0.7	-0.1	-0.1	-0.1

Confidence limits for maximum octane number requirement distributions are given in Appendix G, Table G-1. The 95 percent confidence limits for (R+M)/2 octane number requirements varied from ±0.3 to ±0.4 at the 50 percent satisfaction level, and from ±0.4 to ±0.6 at the 90 percent satisfaction level.

2. US and Imported Cars

Maximum octane number requirements were determined on 306 US and imported cars with PR, FBRU, and FBRSU fuels.

Maximum (R+M)/2, RON, and MON requirements on all three fuel series are given in Table VII. Octane number requirements with knock sensor-equipped vehicles tested at minimum (low-borderline) levels are given in Table VIII. The maximum (R+M)/2 octane number requirement distributions for all three reference fuels are plotted in Figure 7. Maximum octane number requirements at the 50 percent and 90 percent satisfaction levels are:

MAXIMUM OCTANE NUMBER REQUIREMENTS

(US and Imported Cars)

	50% Satisfied			*90% Satisfied*		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	87.3	87.3	87.3	92.6	92.6	92.6
FBRU	85.0	88.8	81.2	89.5	94.4	84.6
FBRSU	84.8	89.9	79.7	89.6	95.6	83.5

Differences between the 1986 and 1985 Survey maximum (R+M)/2, RON, and MON requirements are also shown in Tables VII and VIII for PR, FBRU, and FBRSU fuels. Differences between 1986 and 1985 data at the 50 percent and 90 percent satisfaction levels are:

DIFFERENCES BETWEEN 1986 AND 1985 MAXIMUM OCTANE NUMBER REQUIREMENTS

(US and Imported Cars)

	50% Satisfied			90% Satisfied		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	-0.8	-0.8	-0.8	-0.4	-0.4	-0.4
FBRU	-1.2	-1.6	-0.9	-0.5	-0.6	-0.5
FBRSU	-1.2	-1.6	-0.9	-0.6	-0.7	-0.6

Confidence limits for maximum octane number requirement distributions of 1986 US and imported cars are given in Appendix G, Table G-1. The 95 percent confidence limits for (R+M)/2 requirements varied from ±0.3 to ±0.5 at the 50 percent satisfaction level, and from ±0.5 to ±0.6 at the 90 percent satisfaction level.

3. US Vehicles

Maximum octane number requirements were determined on 314 US vehicles with PR, FBRU, and FBRSU fuels.

Distributions of maximum (R+M)/2 octane number requirements are plotted in Figure 8 for the three fuel series. Maximum (R+M)/2, RON, and MON requirements for the US vehicles are given in Table IX. Octane number requirements with knock sensor-equipped vehicles tested at minimum (low-borderline) levels are given in Table X. Octane number requirements at the 50 percent and 90 percent satisfaction levels are:

MAXIMUM OCTANE NUMBER REQUIREMENTS

(US Vehicles)

Fuel	50% Satisfied (R+M)/2	RON	MON	90% Satisfied (R+M)/2	RON	MON
PR	87.7	87.7	87.7	92.9	92.9	92.9
FBRU	85.5	89.4	81.6	90.2	95.2	85.2
FBRSU	85.2	90.4	80.0	90.1	96.2	84.0

Differences between maximum octane number requirements of 1986 and 1985 US vehicles for the three fuel series are also given in Tables IX and X, in terms of (R+M)/2, RON, and MON. Differences between octane number requirements of 1986 and 1985 US vehicles at the 50 percent and 90 percent satisfaction levels are:

DIFFERENCES BETWEEN 1986 AND 1985 MAXIMUM OCTANE NUMBER REQUIREMENTS

(US Vehicles)

Fuel	50% Satisfied (R+M)/2	RON	MON	90% Satisfied (R+M)/2	RON	MON
PR	-1.1	-1.1	-1.1	+0.2	+0.2	+0.2
FBRU	-1.0	-1.3	-0.7	-0.2	-0.3	-0.2
FBRSU	-1.0	-1.3	-0.7	-0.1	-0.1	-0.1

Confidence limits for maximum octane number requirement distributions of 1986 US vehicles are tabulated in Appendix G, Table G-1. The 95 percent confidence limits for (R+M)/2 octane number requirements were from ±0.4 to ±0.5 at the 50 percent satisfaction level, and from ±0.5 to ±0.6 at the 90 percent satisfaction level.

4. US Cars

Maximum octane number requirements were determined on 250 US cars with PR, FBRU, and FBRSU fuels.

Distributions of maximum (R+M)/2 octane number requirements are plotted in Figure 9 for the three fuel series. Maximum (R+M)/2, RON, and MON requirements for all three fuel series are given in Table XI. Octane number requirements with knock sensor-equipped vehicles tested at minimum (low-borderline) levels are given in Table XII. Maximum octane number requirements for the 50 percent and 90 percent satisfaction levels are:

MAXIMUM OCTANE NUMBER REQUIREMENTS

(US Cars)

Fuel	50% Satisfied			90% Satisfied		
	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	87.5	87.5	87.5	92.8	92.8	92.8
FBRU	85.4	89.3	81.4	90.2	95.2	85.2
FBRSU	85.0	90.2	79.9	90.0	96.1	83.9

Differences between the maximum (R+M)/2, RON, and MON requirements of US cars tested in the 1986 and 1985 Surveys are also given in Tables XI and XII for all three fuel series. The differences at the 50 percent and 90 percent satisfaction levels are:

DIFFERENCES BETWEEN 1986 AND 1985 MAXIMUM OCTANE NUMBER REQUIREMENTS

(US Cars)

Fuel	50% Satisfied			90% Satisfied		
	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	-0.6	-0.6	-0.6	-0.3	-0.3	-0.3
FBRU	-0.9	-1.1	-0.7	-0.1	-0.2	-0.1
FBRSU	-1.0	-1.2	-0.7	-0.6	-0.6	-0.6

Confidence limits for maximum octane number requirement distributions of 1986 US cars are given in Appendix G, Table G-1. The 95 percent confidence limits for (R+M)/2 octane number requirements varied between ±0.4 and ±0.5 at the 50 percent satisfaction level, and between ±0.6 and ±0.7 at the 90 percent satisfaction level.

5. Imported Vehicles

Maximum octane number requirements were determined on sixty-three imported vehicles with PR, FBRU, and FBRSU fuels. Maximum (R+M)/2 octane number requirements for all three reference fuel series are plotted in Figure 10. Maximum octane number requirements in terms of (R+M)/2, RON, and MON are given in Table XIII. Octane number requirements with knock sensor-equipped vehicles tested at minimum (low-borderline) levels are given in Table XIV. The 50 percent and 90 percent satisfaction level maximum octane number requirements are:

MAXIMUM OCTANE NUMBER REQUIREMENTS

(Imported Vehicles)

	50% Satisfied			90% Satisfied		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	87.4	87.4	87.4	92.8	92.8	92.8
FBRU	84.6	88.3	81.0	88.0	92.7	83.4
FBRSU	84.9	90.0	79.8	88.0	93.8	82.1

Differences between the maximum (R+M)/2, RON, and MON requirements of imported vehicles in the 1986 and 1985 Surveys are also given in Tables XIII and XIV for all three fuel series. The differences at the 50 percent and 90 percent satisfaction levels are:

DIFFERENCES BETWEEN 1986 AND 1985 MAXIMUM OCTANE NUMBER REQUIREMENTS

(Imported Vehicles)

	50% Satisfied			90% Satisfied		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	-1.4	-1.4	-1.4	-0.3	-0.3	-0.3
FBRU	-1.7	-2.2	-1.2	-0.9	-1.0	-0.7
FBRSU	-1.3	-1.6	-0.9	-0.9	-1.1	-0.9

Confidence limits for maximum octane number requirement distributions of 1986 imported vehicles are tabulated in Appendix G, Table G-1. The 95 percent confidence limits for (R+M)/2 octane number requirements were from ±0.6 to ±1.1 at the 50 percent satisfaction level, and from ±0.9 to ±1.5 at the 90 percent satisfaction level.

6. US and Imported Knock-Sensor Vehicles Only

Maximum octane number requirements (high-borderline) were determined on 134 US and imported vehicles containing knock sensors on PR, FBRU, and FBRSU fuels. Minimum (low-borderline) octane number requirements were determined on 119 vehicles.

The distributions of maximum (R+M)/2 octane number requirements at the maximum (high-borderline) and the minimum (low-borderline) levels are shown in Figures 11 and 12, respectively, for the three fuel series. Maximum (R+M)/2, RON, and MON requirements for all three fuel series are given in Table XV. Octane number requirements with knock sensor-equipped vehicles tested at minimum (low-borderline) levels are given in Table XVI. Maximum octane number requirements for the 50 percent and 90 percent satisfaction levels are:

MAXIMUM OCTANE NUMBER REQUIREMENTS

(1986 US and Imported Knock Sensor Vehicles Only)

	50% Satisfied			90% Satisfied		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	88.2	88.2	88.2	93.4	93.4	93.4
FBRU	85.4	89.3	81.5	90.2	95.2	85.2
FBRSU	85.4	90.6	80.1	90.1	96.2	84.0

Differences between 1986 and 1985 Survey maximum (R+M)/2, RON, and MON requirements are also shown in Tables XV and XVI. Distributions of maximum (R+M)/2 octane number requirements are shown in Figure 13 for FBRU fuels. The differences at the 50 percent and 90 percent satisfaction levels are:

DIFFERENCES BETWEEN 1986 AND 1985 MAXIMUM OCTANE NUMBER REQUIREMENTS

(US and Imported Knock Sensor Vehicles Only)

	50% Satisfied			90% Satisfied		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	-1.0	-1.0	-1.0	-1.3	-1.3	-1.3
FBRU	-1.3	-1.6	-1.0	-1.3	-1.5	-1.1
FBRSU	-0.5	-0.8	-0.4	-1.2	-1.3	-1.1

The differences between the maximum octane number requirements of 134 vehicles tested, and the octane number requirements at minimum (low-borderline) levels of 119 vehicles are:

DIFFERENCES BETWEEN MAXIMUM AND MINIMUM OCTANE NUMBER REQUIREMENTS

(1986 US and Imported Knock Sensor Vehicles Only)

	50% Satisfied			90% Satisfied		
Fuel	(R+M)/2	RON	MON	(R+M)/2	RON	MON
PR	2.3	2.3	2.3	1.8	1.8	1.8
FBRU	2.0	2.5	1.4	1.6	1.8	1.3
FBRSU	2.5	3.1	1.8	1.4	1.6	1.2

Confidence limits for maximum octane number requirement distributions of 1986 US and imported knock-sensor vehicles only are given in Appendix G, Table G-1. The 95 percent confidence limits for (R+M)/2 octane number requirements (high-borderline) varied between ±0.6 and ±0.7 at the 50 percent satisfaction level, and between ±0.9 and ±1.0 at the 90 percent satisfaction level.

The 95 percent confidence limits for (R+M)/2 octane number requirements (low-borderline) varied between ±0.8 and ±0.9 at the 50 percent satisfaction level, and between ±1.0 and ±1.2 at the 90 percent satisfaction level.

B. Part-Throttle Requirements

The throttle positions for maximum octane number requirements of tested vehicles were reported as maximum-throttle or part-throttle. In the 1986 Survey, 29 of 373 vehicles (8 percent) had part-throttle octane number requirements greater than their maximum-throttle octane number requirements. The percentages of all vehicles having maximum requirements at part-throttle were 10 percent in 1985 and 9 percent in 1984.

C. Select Models

Six select models, representing six engine-chassis combinations, were tested. The select models tested in this year's Survey included two knock sensor-equipped models. The identification and specifications of the engine-chassis combinations of the select models are in Table I.

Maximum octane number requirements for each select model at various satisfaction levels are listed in Tables XVII through XXII. The maximum (high-borderline) and minimum (low-borderline) octane number requirements for the two knock sensor-equipped models are given in Tables XIX and XXII.

D. Tank Fuel

Tank fuel was tested for incidence of knock on all vehicles. Owners' questionnaires, however, were obtained only when the vehicle tested had a regular driver and the ignition timing did not have to be reset.

1. Owner/Rater Comparisons of Tank Fuel Knock

For 160 vehicles, both owner and rater data were reported, and no adjustments of spark timing were made. The trained raters reported that 33 percent of the vehicles knocked, while the owners reported that 16 percent knocked, an owner/rater knock ratio of 0.49. The 33 percent of vehicles found to be knocking by trained raters is lower than in the 1985 Survey. These owner/rater comparisons of tank fuel knock for 1986, along with previous Survey data back to 1979, are presented in Table XXIII.

Tank fuel RON and MON data were reported for a total of eighty-six vehicles with both owner/rater data and no adjustments of spark timing. Seventy-one vehicles were reported to have tank fuel octane numbers less than 90.0 (R+M)/2. Trained observers reported knock on 27 percent of these, compared with 11 percent for owners. Of the other fifteen vehicles having tank fuels greater than or equal to 90.0 (R+M)/2, 27 percent knocked according to trained raters, and 7 percent according to owners.

2. Objectionable Versus Non-Objectionable Knock

Of the owners reporting tank-fuel knock with vehicles which had no change in spark timing, 15 percent found the knock to be objectionable, in comparison with 52 percent in the 1985 Survey. Comparisons of objectionable knock for 1979 through 1986 Surveys are also given in Table XXIII.

3. Tank Fuel Knock Reported by Trained Raters

On a total basis, tank fuel knock observations were reported for 330 of the 377 vehicles tested. The percentages of all 1986 vehicles knocking on tank fuel are shown in Table XXIV. On a weighted basis, 31 percent of the 1986 vehicles tested knocked on tank fuel, compared with 37 percent in the 1985 Survey. (On an unweighted basis 32 percent of the 330 vehicles tested on tank fuel in the 1986 Survey were found to knock on tank fuel.)

The percentages of selected models knocking on tank fuel, also shown in Table XXIV varied from a low of 0 percent to a high of 64 percent.

E. Engine Speed for Maximum Octane Number Requirements

Engine speeds at which maximum octane number requirements occurred for each select model are shown in Table XXV for PR, FBRU, and FBRSU fuels. Weighted data for all 1986 vehicles are shown in Table XXVI.

F. Gear Position for Maximum Octane Number Requirements

The throttle/gear position for maximum octane number requirements on FBRU fuels is shown in Table XXVII. Of the 377 vehicles tested, 316 (84 percent) were equipped with automatic transmissions and 61 (16 percent) were equipped with manual transmissions.

Maximum requirements at maximum-throttle occurred in 93 percent of the automatic transmission vehicles (20 percent in fourth gear, 50 percent in third gear, and 23 percent in second gear). Maximum requirements at part-throttle occurred in 7 percent of the automatic transmission vehicles (3 percent in fourth gear, and 4 percent in third gear).

For manual transmission vehicles, 88 percent had maximum requirements at maximum-throttle (67 percent in fourth gear, 20 percent in third gear, and 2 percent in second gear). Maximum requirements at part-throttle occurred in 12 percent of manual transmission vehicles (10 percent in fourth gear, and 2 percent in third gear). Fifth gear for five-speed manual transmissions was not examined per program instructions.

T A B L E S

AND

F I G U R E S

TABLE I

1986 SELECT MODEL SPECIFICATIONS

Model	Disp. Liters	Engine Type	Fuel System Type*	Comp. Ratio	Brake HP	Trans-mission
Chrysler Corporation:						
Reliant/Aries/600/ Lancer/LeBaron	2.2	L-4	TBI	9.5	97	Automatic
Reliant/Aries/Lancer/ Caravelle	2.5	L-4	TBI	9.0	100	Automatic
Ford Motor Company:						
Taurus/Sable	3.0	V-6	MFI	9.2	140	Automatic
LTD Crown Victoria/ Grand Marquis/Thunderbird	5.0	V-8	MFI	8.9	150	Automatic
General Motors Corporation:						
Celebrity/6000/Ciera/ Century	2.5	L-4	TBI	9.0	92	Automatic
Olds 98/Toronada/Electra/ Riviera	3.8	V-6	MFI	8.5	150	Automatic

* TBI = Throttle Body Fuel Injection; MFI = Manifold Fuel Injection. Individual manufacturers may use different abbreviations.

TABLE II

DISTRIBUTION OF ODOMETER MILEAGE FOR TESTED VEHICLES

Mileage	No. of Vehicles Within Mileage Increments	
	1985 Vehicles	1986 Vehicles
0 - 1,999	0	1
2,000 - 3,999	0	0
4,000 - 5,999	0	1
6,000 - 7,999	78	103
8,000 - 9,999	81	63
10,000 - 11,999	78	63
12,000 - 13,999	31	53
14,000 - 15,999	29	20
16,000 - 17,999	19	26
18,000 - 19,999	16	16
20,000 - 24,999	27	14
25,000 - 29,999	10	13
30,000 +	5	4
No. of Vehicles	374	377
Average Mileage	12,343	11,849

TABLE III

1986 BASIC TIMING ADJUSTMENTS

Degrees From Manufacturer's Setting	No. of Vehicles +	No. of Vehicles -
1	3	2
2	4	6
3	2	4
4	0	0
5	0	0
6	1	0
7	0	0
8	0	0
9	0	0
10	0	0
11+	0	0
	10	12

TOTAL 22

TABLE IV

MAXIMUM OTANE NUMBER REQUIREMENTS WITH 95% CONFIDENCE LIMITS

	Fuel	No. Vehicles	(R+M)/2 50% Sat.	(R+M)/2 90% Sat.	Research Octane No. 50% Sat.	Research Octane No. 90% Sat.	Motor Octane No. 50% Sat.	Motor Octane No. 90% Sat.
US and Imported Vehicles	PR	377	87.6 ± 0.4	92.9 ± 0.6	87.6 ± 0.4	92.9 ± 0.6	87.6 ± 0.4	92.9 ± 0.6
	FBRU	377	85.3 ± 0.3	89.8 ± 0.4	89.2 ± 0.4	94.8 ± 0.6	81.4 ± 0.2	84.9 ± 0.3
	FBRSU	377	85.2 ± 0.4	89.8 ± 0.5	90.4 ± 0.4	95.9 ± 0.6	80.0 ± 0.3	83.7 ± 0.4
US and Imported Cars	PR	306	87.3 ± 0.5	92.6 ± 0.6	87.3 ± 0.5	92.6 ± 0.6	87.3 ± 0.5	92.6 ± 0.6
	FBRU	306	85.0 ± 0.3	89.5 ± 0.5	88.8 ± 0.4	94.4 ± 0.6	81.2 ± 0.2	84.6 ± 0.3
	FBRSU	306	84.8 ± 0.4	89.6 ± 0.5	89.9 ± 0.5	95.6 ± 0.7	79.7 ± 0.3	83.5 ± 0.4
US Vehicles	PR	313	87.7 ± 0.5	92.9 ± 0.6	87.7 ± 0.5	92.9 ± 0.6	87.7 ± 0.5	92.9 ± 0.6
	FBRU	314	85.5 ± 0.4	90.2 ± 0.5	89.4 ± 0.5	95.2 ± 0.7	81.6 ± 0.3	85.2 ± 0.4
	FBRSU	314	85.2 ± 0.4	90.1 ± 0.6	90.4 ± 0.5	96.2 ± 0.7	80.0 ± 0.4	84.0 ± 0.5
US Cars	PR	249	87.5 ± 0.5	92.8 ± 0.7	87.5 ± 0.5	92.8 ± 0.7	87.5 ± 0.5	92.8 ± 0.7
	FBRU	250	85.4 ± 0.4	90.2 ± 0.6	89.3 ± 0.6	95.2 ± 0.7	81.4 ± 0.3	85.2 ± 0.4
	FBRSU	250	85.0 ± 0.5	90.0 ± 0.7	90.2 ± 0.6	96.2 ± 0.8	79.9 ± 0.4	83.9 ± 0.5
Imported Vehicles	PR	63	87.4 ± 1.1	92.8 ± 1.5	87.4 ± 1.1	92.8 ± 1.5	87.4 ± 1.1	92.8 ± 1.5
	FBRU	63	84.6 ± 0.7	88.0 ± 1.0	88.3 ± 0.9	92.7 ± 1.2	81.0 ± 0.5	83.4 ± 0.7
	FBRSU	63	84.9 ± 0.6	88.0 ± 0.9	90.0 ± 0.8	93.8 ± 1.1	79.8 ± 0.5	82.1 ± 0.7
US and Imported Knock-Sensor Vehicles	PR	134	88.2 ± 0.7	93.4 ± 1.0	88.2 ± 0.7	93.4 ± 1.0	88.2 ± 0.7	93.4 ± 1.0
	FBRU	134	85.4 ± 0.6	90.2 ± 0.9	89.3 ± 0.8	95.2 ± 1.1	81.5 ± 0.5	85.2 ± 0.7
	FBRSU	134	85.4 ± 0.7	90.1 ± 0.9	90.6 ± 0.8	96.2 ± 1.1	80.1 ± 0.5	84.0 ± 0.7

TABLE V

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US AND IMPORTED VEHICLES

(For Knock Sensor-Equipped Vehicles, Maximum Octane Number Requirements Are Used)

Percent Satisfied	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.8	-0.9	81.3	-1.2	84.2	-1.4	78.5	-0.8	81.1	-1.0	85.3	-1.1	77.0	-0.7
20	84.6	-0.9	82.7	-1.0	85.9	-1.2	79.6	-0.7	82.3	-1.3	86.8	-1.6	77.9	-1.0
30	85.7	-0.9	83.8	-1.0	87.2	-1.3	80.4	-0.6	83.2	-1.7	87.8	-2.2	78.5	-1.3
40	86.7	-0.9	84.4	-1.4	88.1	-1.7	80.8	-1.0	84.1	-1.4	89.0	-1.8	79.2	-1.0
50	87.6	-1.2	85.3	-1.1	89.2	-1.4	81.4	-0.9	85.2	-1.0	90.4	-1.3	80.0	-0.7
60	88.7	-1.2	86.2	-0.8	90.3	-1.1	82.1	-0.6	86.2	-0.7	91.7	-0.9	80.7	-0.6
70	89.8	-0.8	87.0	-0.8	91.3	-1.0	82.7	-0.5	87.1	-0.7	92.8	-0.8	81.4	-0.6
80	91.1	-0.4	88.0	-0.7	92.6	-0.9	83.4	-0.5	88.1	-0.7	93.9	-0.9	82.3	-0.6
90	92.9	+0.1	89.8	-0.3	94.8	-0.3	84.9	-0.3	89.8	-0.1	95.9	-0.1	83.7	-0.1
95	94.1	0.0	91.2	-0.7	96.4	-0.8	86.0	-0.6	91.2	+0.2	97.4	+0.3	85.0	+0.2
98	95.4	-0.9	93.2	-0.2	98.6	-0.3	87.8	-0.2	93.5	-0.6	100.0	-0.6	87.0	-0.6
99	96.5	-	93.9	-2.3	99.4	-2.4	88.5	-2.1	94.5	-	101.1	-	88.0	-

TABLE VI

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US AND IMPORTED VEHICLES

(For Knock Sensor-Equipped Vehicles, Minimum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.1	-0.3	80.4	-1.1	83.1	-1.2	77.7	-0.9	79.8	-1.1	83.7	-1.3	75.9	-0.9
20	84.0	-0.7	82.2	-0.9	85.3	-1.1	79.2	-0.7	81.8	-1.0	86.1	-1.3	77.6	-0.6
30	85.1	-0.9	83.2	-0.8	86.5	-1.0	79.9	-0.7	82.7	-1.2	87.2	-1.6	78.1	-1.0
40	86.2	-0.7	84.0	-1.0	87.5	-1.3	80.5	-0.7	83.5	-1.4	88.3	-0.7	78.8	-1.0
50	87.0	-1.0	84.8	-1.1	88.5	-1.4	81.0	-0.9	84.5	-1.1	89.5	-1.5	79.5	-0.8
60	88.1	-0.9	85.7	-0.8	89.7	-1.0	81.7	-0.6	85.6	-0.8	90.9	-1.0	80.3	-0.6
70	89.2	-1.0	86.7	-0.6	90.9	-0.9	82.4	-0.5	86.8	-0.5	92.4	-0.6	81.2	-0.4
80	90.5	-0.6	87.6	-0.8	92.2	-0.9	83.1	-0.6	87.8	-0.6	93.6	-0.8	82.0	-0.5
90	92.4	-0.1	89.0	-0.8	93.9	-0.8	84.2	-0.7	89.3	-0.5	95.3	-0.6	83.3	-0.4
95	93.8	+0.1	90.7	-1.1	95.8	-1.2	85.6	-0.9	90.7	-0.1	96.8	-0.1	84.6	0.0
98	95.3	-1.6	93.2	0.0	98.6	-0.1	87.8	0.0	93.5	+0.6	100.0	+0.7	87.0	+0.5
99	96.3	-2.6	93.9	-0.6	99.4	-0.6	88.5	-0.5	94.5	-	101.1	-	88.0	-

TABLE VII

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US AND IMPORTED CARS

(For Knock Sensor-Equipped Vehicles, Maximum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.8	-0.5	81.3	-0.8	84.1	-1.0	78.5	-0.6	81.3	-0.8	85.4	-1.1	77.1	-0.6
20	84.4	-0.7	82.6	-0.9	85.8	-1.0	79.5	-0.7	82.4	-1.0	86.8	-1.4	77.9	-0.8
30	85.6	-0.6	83.7	-0.7	87.0	-0.9	80.3	-0.5	83.1	-1.6	87.8	-1.9	78.5	-1.1
40	86.5	-0.6	84.3	-1.2	87.8	-1.6	80.7	-0.9	83.9	-1.5	88.8	-1.9	79.1	-1.0
50	87.3	-0.8	85.0	-1.2	88.8	-1.6	81.2	-0.9	84.8	-1.2	89.9	-1.6	79.7	-0.9
60	88.2	-1.0	85.9	-1.0	89.9	-1.3	81.9	-0.7	85.8	-1.0	91.2	-1.2	80.4	-0.8
70	89.4	-0.8	86.7	-1.0	90.9	-1.3	82.4	-0.8	86.8	-1.0	92.4	-1.2	81.2	-0.8
80	90.7	-0.6	87.6	-1.1	92.1	-1.4	83.1	-0.8	87.8	-1.1	93.6	-1.2	82.0	-0.9
90	92.6	-0.4	89.5	-0.5	94.4	-0.6	84.6	-0.5	89.6	-0.6	95.6	-0.7	83.5	-0.6
95	93.8	-0.8	91.2	-0.5	96.4	-0.5	86.0	-0.4	91.0	-0.8	97.2	-0.8	84.8	-0.7
98	95.1	-3.2	92.9	-2.6	98.3	-2.7	87.5	-2.4	93.2	-1.7	99.7	-1.7	86.8	-1.6
99	95.8	-	93.5	-	99.0	-	88.1	-	94.0	-	100.6	-	87.5	-

TABLE VIII

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US AND IMPORTED CARS

(For Knock Sensor-Equipped Vehicles, Minimum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.4	-0.5	80.9	-0.2	83.7	-0.2	78.1	-0.2	80.7	+0.2	84.8	+0.2	76.7	+0.2
20	84.2	0.0	82.4	-0.4	85.4	-0.6	79.3	-0.3	82.1	-0.5	86.4	-0.8	77.7	-0.4
30	85.4	-0.3	83.4	-0.5	86.6	-0.7	80.1	-0.4	82.9	-1.0	87.5	-1.2	78.3	-0.7
40	86.4	-0.2	84.1	-0.7	87.6	-1.0	80.6	-0.5	83.7	-1.3	88.5	-1.6	78.9	-0.9
50	87.1	-0.5	84.8	-1.0	88.5	-1.3	81.1	-0.7	84.5	-1.1	89.5	-1.4	79.5	-0.8
60	88.0	-0.6	85.6	-0.9	89.5	-1.1	81.6	-0.7	85.4	-0.9	90.7	-1.1	80.2	-0.6
70	89.1	-0.6	86.4	-0.8	90.6	-1.0	82.2	-0.6	86.5	-0.8	92.1	-0.9	80.9	-0.7
80	90.3	-0.6	87.3	-1.0	91.7	-1.3	82.8	-0.8	87.5	-0.9	93.2	-1.1	81.8	-0.7
90	92.2	-0.4	88.9	-0.7	93.7	-0.8	84.1	-0.6	89.1	-0.8	95.1	-0.9	83.1	-0.7
95	93.5	-0.8	90.7	-0.6	95.8	-0.7	85.6	-0.5	90.6	-1.0	96.8	-1.0	84.5	-0.9
98	94.9	-3.0	92.9	-0.8	98.3	-0.8	87.5	-0.7	93.2	-0.7	99.7	-0.7	86.7	-0.7
99	95.6	-3.7	93.5	-1.3	99.0	-1.3	88.1	-1.2	94.1	-	100.6	-	87.5	-

TABLE IX

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US VEHICLES

(For Knock Sensor-Equipped Vehicles, Maximum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.9	-0.4	81.5	-0.7	84.3	-1.0	78.6	-0.6	81.2	-0.6	85.3	-0.7	77.0	-0.5
20	84.5	-0.8	82.8	-0.8	86.0	-0.9	79.6	-0.7	82.3	-1.2	86.8	-1.4	77.9	-0.8
30	85.7	-0.7	83.9	-0.7	87.3	-1.0	80.4	-0.5	83.3	-1.6	88.0	-2.0	78.6	-1.2
40	86.7	-0.8	84.7	-1.1	88.3	-1.5	81.0	-0.8	84.3	-1.2	89.2	-1.6	79.3	-0.9
50	87.7	-1.1	85.5	-1.0	89.4	-1.3	81.6	-0.7	85.2	-1.0	90.4	-1.3	80.0	-0.7
60	88.8	-1.1	86.3	-0.8	90.5	-1.0	82.2	-0.5	86.3	-0.7	91.8	-0.8	80.8	-0.5
70	89.8	-0.9	87.2	-0.7	91.7	-0.7	82.8	-0.5	87.4	-0.5	93.2	-0.5	81.7	-0.4
80	91.1	-0.5	88.3	-0.7	93.0	-0.8	83.6	-0.6	88.6	-0.5	94.5	-0.6	82.6	-0.5
90	92.9	+0.2	90.2	-0.2	95.2	-0.3	85.2	-0.2	90.1	-0.1	96.2	-0.1	84.0	-0.1
95	94.3	+0.1	91.5	-0.8	96.8	-0.9	86.3	-0.7	91.6	+0.1	97.9	+0.2	85.4	+0.2
98	95.7	-1.2	93.6	-0.3	99.0	-0.4	88.1	-0.4	94.0	-0.6	100.5	-0.6	87.5	-0.5
99	97.0	-	94.2	-2.1	99.6	-2.3	88.7	-2.0	94.6	-	101.2	-	88.1	-

TABLE X

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US VEHICLES

(For Knock Sensor-Equipped Vehicles, Minimum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.1	0.0	81.0	-0.2	83.8	-0.2	78.2	-0.2	80.3	-0.2	84.3	-0.3	76.3	-0.2
20	84.0	-0.3	82.3	-0.6	85.3	-0.8	79.2	-0.5	81.8	-0.7	86.1	-0.9	77.5	-0.5
30	85.1	-0.6	83.2	-0.6	86.5	-0.8	80.0	-0.4	82.6	-1.1	87.2	-1.3	78.1	-0.8
40	86.2	-0.5	84.1	-0.6	87.6	-0.8	80.6	-0.4	83.6	-1.1	88.4	-1.3	78.8	-0.8
50	87.0	-0.8	84.9	-0.8	88.7	-1.0	81.2	-0.5	84.6	-0.9	89.6	-1.2	79.5	-0.7
60	88.2	-0.7	85.8	-0.7	89.9	-0.8	81.8	-0.5	85.6	-0.7	91.0	-0.9	80.3	-0.5
70	89.3	-0.8	86.9	-0.5	91.2	-0.6	82.6	-0.3	87.1	-0.2	92.7	-0.3	81.4	-0.2
80	90.5	-0.6	87.9	-0.7	92.5	-0.9	83.3	-0.6	88.2	-0.6	94.0	-0.7	82.3	-0.5
90	92.4	-0.1	89.6	-0.6	94.5	-0.7	84.7	-0.5	89.7	-0.4	95.8	-0.4	83.6	-0.4
95	93.9	-0.1	91.2	-1.0	96.4	-1.1	86.0	-0.8	91.4	+0.2	97.6	+0.2	85.2	+0.2
98	95.5	-1.8	93.6	+0.2	99.0	+0.2	88.1	+0.1	94.0	+0.8	100.6	+0.9	87.5	+0.8
99	96.9	-2.1	94.2	-0.3	99.6	-0.4	88.7	-0.3	94.6	-	101.2	-	88.1	-

TABLE XI

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US CARS

(For Knock Sensor-Equipped Vehicles, Maximum Octane Number Requirements Are Used)

Percent Satisfied	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.8	-0.3	81.4	-0.5	84.3	-0.6	78.6	-0.3	81.3	-0.6	85.4	-0.8	77.1	-0.5
20	84.4	-0.5	82.7	-0.7	85.8	-1.0	79.5	-0.6	82.4	-0.9	86.8	-1.2	77.9	-0.7
30	85.7	-0.5	83.8	-0.5	87.2	-0.7	80.4	-0.4	83.3	-1.3	88.0	-1.7	78.6	-1.0
40	86.6	-0.4	84.6	-0.8	88.2	-1.2	80.9	-0.6	84.1	-1.3	89.0	-1.6	79.2	-0.9
50	87.5	-0.6	85.4	-0.9	89.3	-1.1	81.4	-0.7	85.0	-1.0	90.2	-1.2	79.9	-0.7
60	88.5	-0.8	86.2	-0.8	90.3	-1.0	82.1	-0.6	86.1	-0.7	91.5	-0.9	80.6	-0.6
70	89.7	-0.7	87.1	-0.8	91.5	-1.0	82.7	-0.6	87.2	-0.6	92.9	-0.7	81.6	-0.4
80	91.1	-0.4	88.1	-0.8	92.8	-0.9	83.5	-0.6	88.3	-0.8	94.2	-0.9	82.4	-0.7
90	92.8	-0.3	90.2	-0.1	95.2	-0.2	85.2	-0.1	90.0	-0.6	96.2	-0.6	83.9	-0.6
95	94.2	-0.6	91.6	-0.7	96.8	-0.8	86.4	-0.5	91.5	-0.9	97.7	-1.0	85.3	-0.7
98	95.4	-3.7	93.1	-2.6	98.5	-2.7	87.7	-2.4	93.5	-1.6	100.0	-1.6	87.0	-1.5
99	96.1	-	93.8	-	99.2	-	88.3	-	94.4	-	101.0	-	87.9	-

TABLE XII

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US CARS

(For Knock Sensor-Equipped Vehicles, Minimum Octane Number Requirements Are Used)

Percent Satisfied	PR Fuels		FBRU Fuels (R+M)/2		FBRU Fuels RON		FBRU Fuels MON		FBRSU Fuels (R+M)/2		FBRSU Fuels RON		FBRSU Fuels MON	
	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.2	+0.7	80.9	+0.1	83.7	+0.2	78.2	+0.1	80.6	+0.7	84.6	+0.5	76.5	+0.5
20	84.0	+0.2	82.3	-0.1	85.4	-0.3	79.2	-0.1	82.0	-0.3	86.3	-0.5	77.6	-0.3
30	85.4	0.0	83.4	-0.4	86.7	-0.7	80.1	-0.3	82.9	-0.8	87.5	-1.0	78.3	-0.6
40	86.4	-0.1	84.3	-0.5	87.9	-0.9	80.8	-0.2	83.8	-1.1	88.6	-0.4	79.0	-0.8
50	87.2	-0.4	85.1	-0.6	88.9	-1.0	81.3	-0.4	84.7	-0.8	89.7	-1.1	79.6	-0.6
60	88.2	-0.5	85.8	-0.6	89.8	-0.7	81.8	-0.5	85.6	-0.6	90.9	-0.7	80.3	-0.4
70	89.4	-0.5	86.7	-0.6	90.9	-0.5	82.4	-0.5	86.8	-0.4	92.4	-0.4	81.2	-0.3
80	90.6	-0.5	87.7	-0.8	92.2	-0.7	83.1	-0.7	87.9	-0.7	93.7	-0.8	82.1	-0.5
90	92.4	-0.4	89.6	-0.4	94.5	-0.4	84.7	-0.3	89.6	-0.8	95.6	-0.9	83.5	-0.8
95	93.9	-0.9	91.2	-0.8	96.4	-0.9	86.0	-0.7	91.2	-0.8	97.4	-1.0	85.0	-0.8
98	95.2	-3.0	93.1	-0.8	98.5	-0.4	87.7	-0.7	93.6	-	100.0	-	87.0	-
99	95.8	-3.4	93.8	-0.9	99.3	-0.6	88.3	-0.9	94.4	-	101.0	-	87.9	-

TABLE XIII

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 IMPORTED VEHICLES

(For Knock Sensor-Equipped Vehicles, Maximum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.6	-2.1	80.6	-2.5	83.3	-3.0	77.8	-2.0	81.0	-1.9	85.1	-2.4	76.8	-1.5
20	84.7	-1.4	82.5	-1.5	85.6	-1.9	79.4	-1.2	82.3	-1.8	86.7	-2.3	77.9	-1.3
30	85.7	-1.3	83.5	-1.8	86.8	-2.3	80.2	-1.2	83.0	-1.9	87.6	-2.4	78.4	-1.4
40	86.6	-1.3	84.1	-1.9	87.6	-2.4	80.6	-1.3	83.8	-1.8	88.6	-2.4	79.0	-1.3
50	87.4	-1.4	84.6	-1.7	88.3	-2.2	81.0	-1.2	84.9	-1.3	90.0	-1.6	79.8	-0.9
60	88.4	-1.4	85.7	-1.0	89.7	-1.3	81.7	-0.8	85.9	-0.9	91.3	-1.1	80.5	-0.7
70	89.7	-0.8	86.5	-1.0	90.6	-1.4	82.3	-0.7	86.5	-1.0	92.1	-1.2	81.0	-0.8
80	91.1	-0.4	87.2	-1.0	91.6	-1.2	82.8	-0.7	87.1	-1.1	92.8	-1.3	81.5	-0.9
90	92.8	-0.3	88.0	-0.9	92.7	-1.0	83.4	-0.7	88.0	-0.9	93.8	-1.1	82.1	-0.9
95	93.8	-0.1	89.5	-0.3	94.4	-0.3	84.6	-0.2	89.4	-0.1	95.4	-0.1	83.4	0.0
98	94.7	-	-	-	-	-	-	-	-	-	-	-	-	-
99	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XIV

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 IMPORTED VEHICLES

(For Knock Sensor-Equipped Vehicles, Minimum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	82.0	-2.3	79.7	-3.0	82.3	-3.6	77.1	-2.4	78.8	-3.8	82.6	-4.5	75.0	-3.1
20	83.6	-2.2	82.0	-1.8	84.9	-2.4	79.0	-1.4	82.0	-1.8	86.3	-2.3	77.6	-1.4
30	85.2	-1.5	83.2	-1.6	86.4	-2.2	79.9	-1.2	82.7	-2.0	87.3	-2.4	78.2	-1.4
40	86.2	-1.4	83.9	-1.9	87.3	-2.5	80.4	-1.4	83.4	-2.0	88.1	-2.6	78.7	-1.4
50	87.1	-1.4	84.3	-1.9	87.9	-2.4	80.8	-1.3	84.3	-1.7	89.3	-2.1	79.4	-1.2
60	87.9	-1.6	85.1	-1.5	89.0	-1.8	81.3	-1.1	85.5	-1.1	90.9	-1.2	80.2	-0.8
70	89.2	-1.1	86.2	-1.0	90.3	-1.3	82.1	-0.7	86.3	-1.0	91.8	-1.2	80.8	-0.8
80	90.6	-0.5	86.9	-1.0	91.2	-1.3	82.6	-0.7	86.9	-1.1	92.6	-1.2	81.3	-0.9
90	92.4	-0.1	87.7	-0.9	92.3	-1.1	83.2	-0.6	87.7	-1.0	93.4	-1.2	81.9	-0.8
95	93.3	0.0	88.3	-0.8	93.0	-0.9	83.6	-0.6	88.3	-0.9	94.1	-1.1	82.4	-0.8
98	94.6	+0.7	-	-	-	-	-	-	-	-	-	-	-	-
99	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XV

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US AND IMPORTED KNOCK SENSOR-EQUIPPED VEHICLES ONLY

(For Knock Sensor-Equipped Vehicles, Maximum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	80.2	-3.6	78.8	-3.9	81.3	-4.6	76.3	-3.2	78.9	-3.0	82.7	-3.5	75.1	-2.5
20	84.0	-1.2	82.3	-1.3	85.3	-1.5	79.2	-0.9	81.7	-1.4	85.9	-1.8	77.4	-1.0
30	85.5	-0.7	83.5	-0.6	86.9	-0.7	80.2	-0.4	82.9	-1.6	87.5	-2.0	78.3	-1.2
40	86.9	-0.6	84.3	-1.0	87.9	-1.3	80.7	-0.7	84.1	-1.1	89.0	-1.5	79.2	-0.8
50	88.2	-1.0	85.4	-1.3	89.3	-1.6	81.5	-1.0	85.4	-0.5	90.6	-0.8	80.1	-0.4
60	89.2	-1.2	86.3	-0.9	90.4	-1.2	82.1	-0.7	86.3	-0.7	91.8	-0.8	80.8	-0.6
70	90.2	-1.2	87.4	-0.5	91.8	-0.7	82.9	-0.4	87.3	-0.6	93.0	-0.7	81.6	-0.5
80	91.6	-0.9	88.6	-0.4	93.3	-0.5	83.8	-0.4	88.6	-0.3	94.5	-0.4	82.7	-0.2
90	93.4	-1.3	90.2	-1.3	95.2	-1.5	85.2	-1.1	90.1	-1.2	96.2	-1.3	84.0	-1.1
95	94.2	-2.7	90.8	-3.5	96.0	-3.8	85.7	-3.1	90.8	-3.6	96.9	-4.0	84.6	-3.3
98	94.9	-	91.4	-	96.6	-	86.2	-	91.4	-	97.7	-	85.2	-
99	-	-	-	-	-	-	-	-	91.9	-	98.2	-	85.6	-

TABLE XVI

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 US AND IMPORTED KNOCK SENSOR-EQUIPPED VEHICLES ONLY

(For Knock Sensor-Equipped Vehicles, Minimum Octane Number Requirements Are Used)

	PR Fuels		FBRU Fuels						FBRSU Fuels					
			(R+M)/2		RON		MON		(R+M)/2		RON		MON	
Percent Satisfied	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985	1986	Δ from 1985
10	77.8	-1.2	76.5	-2.3	78.7	-2.6	74.3	-2.0	76.4	-2.1	79.7	-2.5	73.0	-1.8
20	81.8	-0.7	80.0	-1.6	82.6	-2.0	77.4	-1.3	79.0	-1.2	82.8	-1.3	75.2	-1.0
30	83.4	-0.6	81.8	-0.8	84.8	-1.0	78.8	-0.7	80.9	-0.6	85.0	-0.7	76.8	-0.5
40	84.6	-0.6	82.8	-0.4	86.0	-0.5	79.6	-0.4	82.0	-0.9	86.3	-1.2	77.7	-0.6
50	85.9	0.0	83.4	-0.4	86.8	-0.4	80.1	-0.3	82.9	-0.6	87.5	-0.7	78.3	-0.4
60	87.1	+0.3	84.2	0.0	87.7	-0.1	80.6	-0.1	83.9	0.0	88.8	0.0	79.1	0.0
70	88.5	+0.6	85.6	+0.8	89.5	+1.0	81.6	+0.6	85.3	+0.7	90.6	+1.0	80.1	+0.5
80	89.6	+0.6	87.1	+0.9	91.4	+1.1	82.7	+0.6	87.3	+1.5	93.0	+1.8	81.6	+1.2
90	91.6	-1.3	88.6	-0.5	93.4	-0.5	83.9	-0.3	88.7	+0.1	94.6	+0.1	82.8	+0.2
95	93.3	-4.0	89.5	-3.7	94.4	-4.2	84.6	-3.1	89.8	-3.3	95.9	-3.7	83.7	-3.0
98	94.2	-4.8	90.2	-4.3	95.2	-4.8	85.2	-3.8	90.4	-	96.5	-	84.3	-
99	94.9	-	90.6	-	95.7	-	85.5	-	90.8	-	96.9	-	84.6	-

TABLE XVII

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

MODEL: PKD T22A3/KKD T22A3/KED T22A3/KHD T22A3/DCD T22A3

Percent Satisfied	PR ON	FBRU (R+M)/2	FBRU RON	FBRU MON	FBRSU (R+M)/2	FBRSU RON	FBRSU MON
5	83.0	80.9	83.7	78.2	80.4	84.4	76.3
10	84.0	81.8	84.7	78.8	81.2	85.4	77.0
20	85.1	82.8	86.0	79.6	82.2	86.7	77.8
30	86.0	83.5	86.9	80.1	83.0	87.6	78.3
40	86.7	84.1	87.6	80.6	83.6	88.4	78.8
50	87.4	84.7	88.4	81.0	84.2	89.1	79.3
60	88.0	85.3	89.1	81.4	84.8	89.8	79.8
70	88.7	85.9	89.8	81.9	85.4	90.6	80.2
80	89.6	86.6	90.7	82.4	86.2	91.5	80.8
90	90.8	87.6	92.0	83.2	87.2	92.8	81.6
95	91.7	88.4	93.0	83.8	88.0	93.8	82.3
N	14		14			14	
Mean	87.4	84.7	88.4	81.0	84.2	89.1	79.3
Std. Dev.	2.7	2.3	2.8	1.7	2.3	2.9	1.8

TABLE XVIII

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

MODEL: PKK T25A3/KKK T25A3/PEK T25A3/KHK T25A3

Percent Satisfied	PR ON	FBRU (R+M)/2	FBRU RON	FBRU MON	FBRSU (R+M)/2	FBRSU RON	FBRSU MON
5	81.1	80.6	83.1	78.0	79.8	83.7	75.9
10	82.2	81.4	84.2	78.6	80.7	84.7	76.6
20	83.5	82.3	85.4	79.3	81.7	86.0	77.4
30	84.5	83.0	86.3	79.8	82.5	87.0	78.0
40	85.4	83.6	87.0	80.2	83.1	87.8	78.5
50	86.1	84.2	87.7	80.6	83.7	88.5	79.0
60	86.9	84.8	88.5	81.1	84.4	89.3	79.4
70	87.7	85.4	89.2	81.5	85.0	90.1	79.9
80	88.7	86.1	90.1	82.0	85.8	91.0	80.5
90	90.0	87.0	91.3	82.7	86.8	92.3	81.3
95	91.2	87.8	92.4	83.3	87.7	93.4	82.0
N	12		12			12	
Mean	86.1	84.2	87.7	80.6	83.7	88.5	79.0
Std. Dev.	3.1	2.2	2.8	1.6	2.4	3.0	1.9

TABLE XIX

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

Knock Sensor Select Model - High Borderline
MODEL: ORU P30A4/MRU P30A4/ORU P30A3

Percent Satisfied	PR ON	FBRU (R+M)/2	FBRU RON	FBRU MON	FBRSU (R+M)/2	FBRSU RON	FBRSU MON
5	80.6	79.4	81.8	77.0	78.9	82.6	75.1
10	82.1	80.6	83.3	77.9	80.1	84.1	76.1
20	83.8	82.0	85.1	79.0	81.5	85.9	77.2
30	85.1	83.1	86.4	79.8	82.6	87.1	78.0
40	86.2	84.0	87.5	80.4	83.5	88.2	78.8
50	87.2	84.8	88.5	81.1	84.3	89.3	79.4
60	88.2	85.6	89.5	81.7	85.2	90.3	80.1
70	89.3	86.5	90.6	82.4	86.1	91.4	80.8
80	90.6	87.6	91.9	83.2	87.1	92.7	81.6
90	92.4	89.0	93.7	84.3	88.6	94.4	82.8
95	93.8	90.2	95.2	85.2	89.8	95.9	83.7
N	17		17			17	
Mean	87.2	84.8	88.5	81.1	84.3	89.3	79.4
Std. Dev.	4.0	3.3	4.1	2.5	3.3	4.0	2.6

TABLE XIX
(Continued)

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

Knock Sensor Select Model - Low Borderline
MODEL: ORU P30A4/MRU P30A4/ORU P30A3

Percent Satisfied	PR ON	FBRU (R+M)/2	FBRU RON	FBRU MON	FBRSU (R+M)/2	FBRSU RON	FBRSU MON
5	78.1	79.1	81.6	76.7	78.0	81.6	74.4
10	79.4	79.8	82.4	77.3	78.8	82.5	75.0
20	80.9	80.7	83.4	77.9	79.7	83.6	75.8
30	82.1	81.2	84.1	78.4	80.3	84.4	76.3
40	83.1	81.8	84.7	78.8	80.9	85.0	76.7
50	84.0	82.2	85.3	79.1	81.4	85.7	77.1
60	84.9	82.7	85.9	79.5	81.9	86.3	77.6
70	85.8	83.2	86.5	79.9	82.5	87.0	78.0
80	87.0	83.8	87.2	80.4	83.2	87.8	78.5
90	88.6	84.6	88.2	81.0	84.1	88.9	79.3
95	89.9	85.3	89.1	81.6	84.8	89.8	79.8
N	14		14			14	
Mean	84.0	82.2	85.3	79.1	81.4	85.7	77.1
Std. Dev.	3.6	1.9	2.3	1.5	2.1	2.5	1.6

TABLE XX

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

MODEL: OPF P50A4/MPF P50A4/OSF P50A4

Percent Satisfied	PR ON	FBRU (R+M)/2	FBRU RON	FBRU MON	FBRSU (R+M)/2	FBRSU RON	FBRSU MON
5	84.7	82.1	85.1	79.1	81.4	85.6	77.2
10	85.9	82.9	86.1	79.7	82.2	86.5	77.8
20	87.3	83.9	87.3	80.4	83.1	87.7	78.4
30	88.3	84.6	88.2	80.9	83.7	88.5	78.9
40	89.2	85.1	89.0	81.3	84.3	89.2	79.3
50	90.0	85.7	89.7	81.7	84.8	89.9	79.7
60	90.8	86.3	90.4	82.1	85.3	90.5	80.1
70	91.6	86.8	91.1	82.5	85.9	91.2	80.5
80	92.6	87.5	92.0	83.0	86.5	92.0	81.0
90	94.0	88.5	93.2	83.7	87.4	93.2	81.7
95	95.2	89.3	94.3	84.3	88.2	94.1	82.2
N	11		11			11	
Mean	90.0	85.7	89.7	81.7	84.8	89.9	79.7
Std. Dev.	3.2	2.2	2.8	1.6	2.1	2.6	1.5

TABLE XXI

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODEL

MODEL: NAR T25A3/HAR T25A3/IAR T25A3/LAR T25A3

Percent Satisfied	PR ON	FBRU			FBRSU		
		(R+M)/2	RON	MON	(R+M)/2	RON	MON
5	83.8	83.0	86.5	79.5	83.0	87.9	78.1
10	85.1	84.3	88.1	80.6	84.3	89.4	79.2
20	86.7	85.9	90.0	81.9	85.9	91.3	80.6
30	87.9	87.0	91.3	82.8	87.1	92.6	81.6
40	88.9	88.0	92.5	83.6	88.1	93.8	82.4
50	89.8	88.9	93.6	84.3	89.0	94.8	83.2
60	90.7	89.8	94.7	85.0	89.9	95.9	84.0
70	91.7	90.8	95.8	85.8	90.9	97.1	84.8
80	92.9	92.0	97.2	86.7	92.1	98.4	85.8
90	94.5	93.5	99.1	88.0	93.7	100.3	87.1
95	95.8	94.9	100.7	89.0	95.0	101.8	88.3
N	28	----------28-----------			----------28-----------		
Mean	89.8	88.9	93.6	84.3	89.0	94.8	83.2
Std. Dev.	3.7	3.6	4.3	2.9	3.7	4.2	3.1

TABLE XXII

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

Knock Sensor Select Model - High Borderline
MODEL: ICB P38A4/IEB P38A4/LCB P38A4/LEB P38A4

Percent Satisfied	PR ON	FBRU (R+M)/2	FBRU RON	FBRU MON	FBRSU (R+M)/2	FBRSU RON	FBRSU MON
5	73.9	74.7	76.4	73.0	73.8	76.6	70.9
10	75.6	76.0	78.0	74.0	75.2	78.4	72.1
20	77.7	77.6	79.9	75.3	77.0	80.5	73.5
30	79.1	78.7	81.2	76.2	78.3	82.1	74.6
40	80.4	79.7	82.4	77.0	79.4	83.4	75.5
50	81.6	80.6	83.5	77.7	80.5	84.6	76.3
60	82.8	81.5	84.6	78.5	81.5	85.9	77.1
70	84.0	82.5	85.7	79.3	82.6	87.2	78.0
80	85.5	83.6	87.1	80.2	83.9	88.7	79.1
90	87.6	85.2	89.0	81.4	85.7	90.9	80.5
95	89.3	86.5	90.5	82.5	87.2	92.6	81.7
N	16	----------16----------			----------16----------		
Mean	81.6	80.6	83.5	77.7	80.5	84.6	76.3
Std. Dev.	4.7	3.6	4.3	2.9	4.1	4.9	3.3

TABLE XXII
(Continued)

MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

Knock Sensor Select Model - Low Borderline
MODEL: ICB P38A4/IEB P38A4/LCB P38A4/LEB P38A4

Percent Satisfied	PR ON	FBRU (R+M)/2	FBRU RON	FBRU MON	FBRSU (R+M)/2	FBRSU RON	FBRSU MON
5	71.7	72.2	73.6	70.7	70.9	73.4	68.3
10	73.4	73.6	75.3	71.9	72.5	75.3	69.6
20	75.6	75.3	77.3	73.3	74.4	77.6	71.2
30	77.1	76.5	78.7	74.3	75.8	79.2	72.4
40	78.4	77.5	79.9	75.1	77.0	80.6	73.3
50	79.6	78.5	81.0	75.9	78.1	81.9	74.3
60	80.8	79.5	82.2	76.8	79.2	83.2	75.2
70	82.2	80.5	83.4	77.6	80.4	84.6	76.2
80	83.7	81.7	84.8	78.6	81.8	86.2	77.3
90	85.8	83.4	86.8	80.0	83.7	88.5	78.9
95	87.6	84.8	88.4	81.2	85.3	90.3	80.2
N	16		----------16----------			----------16----------	
Mean	79.6	78.5	81.0	75.9	78.1	81.9	74.3
Std. Dev.	4.8	3.8	4.5	3.2	4.4	5.1	3.6

TABLE XXIII

OWNER/RATER COMPARISON OF TANK FUEL KNOCK

(For Vehicles with Both Owner and Rater Reports and No Adjustment of Spark Timing)

Model Year:	1986	1985	1984	1983	1982	1981	1980	1979
Fuel:	Unleaded	Unleaded	Unleaded	Unleaded	Unleaded	Unleaded*	Unleaded*	Unleaded*
No. of Reports:	160	143	149	129	144	149	218	196
% Knocking								
Trained Rater	33.1	37.8	51.7	59.7	47.9	43.6	51.1	52.6
Owner	16.3	18.9	26.2	29.5	25.0	29.5	31.2	26.0
Owner/Rater Ratio	0.49	0.50	0.51	0.49	0.52	0.68	0.61	0.49
% Owners Objecting								
Based on: Total Reports	2.5	9.8	7.4	12.4	13.2	12.1	15.1	15.8
Owners Reporting Knock	15.4	51.9	28.2	42.1	52.8	40.9	48.5	60.8

* Some vehicles were designed for leaded fuels.

TABLE XXIV

TANK-FUEL KNOCK REPORTED BY TRAINED OBSERVERS

I. US and Imported Vehicles

Model Year	No. in Survey	Vehicles Tested on Tank Fuel: No. Tested	Vehicles Tested on Tank Fuel: % Knocking (Wtg. Avg.)
1986	377	330	31.1
1985	374	327	36.9
1984	407	358	49.3
1983	383	314	44.6
1982	434	342	41.6
1981	417	326	42.9
1980	429	374	49.9
1979	490	414	47.3
1978	434	338	47.2

II. 1986 Select Models

1986 Select Models	No. in Survey	No. Tested	% Knocking
PKD T22A3/KKD T22A3/ KED T22A3/KHD T22A3/ DCD T22A3	14	10	20.0
PKK T25A3/KKK T25A3/ PEK T25A3/KHK T25A3	12	12	0.0
OPF P50A4/MPF P50A4/ OSF P50A4	11	10	50.0
ORU P30A4/MRU P30A4/ORU P30A3 Knock Sensor, Maximum (High-Borderline)	17	14	21.4
NAR T25A3/HAR T25A3/ IAR T25A3/LAR T25A3 Knock Sensor, Maximum (High-Borderline)	28	25	64.0
ICB P38A4/IEB P38A4/ LCB P38A4/LEB P38A4 Knock Sensor, Maximum (High-Borderline)	16	13	23.1

TABLE XXV

ENGINE SPEEDS FOR MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

Percent of Cars Having Maximum Requirements Within Specified Speed (rpm) Ranges

Model:	PKD T22A3/KKD T22A3/KED T22A3/ KHD T22A3/DCD T22A3			PKK T25A3/KKK T25A3/ PEK T25A3/KHK T25A3			OPF P50A4/MPF P50A4/ OSF P50A4		
Fuel:	PR	FBRU	FBRSU	PR	FBRU	FBRSU	PR	FBRU	FBRSU
SPEED RANGE									
1599 and Lower	0	0	0	0	0	0	91	91	91
1600 - 1999	21	29	21	8	8	17	9	0	0
2000 - 2399	37	36	36	34	42	25	0	9	9
2400 - 2799	21	21	29	33	17	25	0	0	0
2800 - 3199	21	14	14	25	33	33	0	0	0
3200 and Higher	0	0	0	0	0	0	0	0	0
No. of Cars	14	14	14	12	12	12	11	11	11

Model:	ORU P30A4/MRU P30A4/ORU P30A3 Knock Sensor, Maximum (High-Borderline)			ORU P30A4/MRU P30A4/ORU P30A3/ Knock Sensor, Minimum (Low-Borderline)		
Fuel:	PR	FBRU	FBRSU	PR	FBRU	FBRSU
SPEED RANGE						
1599 and Lower	42	46	40	36	43	36
1600 - 1999	0	6	6	7	7	7
2000 - 2399	29	24	24	43	29	36
2400 - 2799	29	24	18	7	21	7
2800 - 3199	0	0	6	7	0	7
3200 and Higher	0	0	6	0	0	7
No. of Cars	17	17	17	14	14	14

TABLE XXV
(Continued)

ENGINE SPEEDS FOR MAXIMUM OCTANE NUMBER REQUIREMENTS - 1986 SELECT MODELS

Percent of Cars Having Maximum Requirements Within Specified Speed (rpm) Ranges

Model:	NAR T25A3/HAR T25A3/ IAR T25A3/LAR T25A3			ICB P38A4/IEB P38A4/ LCB P38A4/LEB P38A4 Knock Sensor, Maximum (High Borderline)			ICB P38A4/IEB P38A4/ LCB P38A4/LEB P38A4 Knock Sensor, Mimimum (Low Borderline)		
Fuel:	PR	FBRU	FBRSU	PR	FBRU	FBRSU	PR	FBRU	FBRSU
SPEED RANGE									
1599 and Lower	11	14	11	31	36	36	30	50	50
1600 - 1999	56	68	53	0	0	0	0	0	0
2000 - 2399	29	18	32	8	21	21	10	20	20
2400 - 2799	0	0	4	46	36	29	50	20	10
2800 - 3199	4	0	0	15	7	14	10	10	20
3200 and Higher	0	0	0	0	0	0	0	0	0
No. of Cars	28	28	28	16	16	16	16	16	16

TABLE XXVI

ENGINE SPEEDS FOR MAXIMUM OCTANE NUMBER REQUIREMENTS

Weighted % of Vehicles Having Requirements in Indicated (rpm) Ranges

All 1986 Vehicles

Maximum Requirements Engine Speed Range	PR Fuels	FBRU Fuels	FBRSU Fuels
1599 and Lower	23.1	19.3	17.2
1600 - 1999	23.2	24.6	23.1
2000 - 2399	23.5	23.8	22.1
2400 - 2799	13.8	13.0	12.5
2800 - 3199	10.4	13.1	13.2
3200 - 3599	3.6	4.4	7.4
3600 and Higher	2.4	1.8	4.5

TABLE XXVII

THROTTLE/GEAR POSITION FOR 1986 MAXIMUM

FBRU OCTANE NUMBER REQUIREMENTS

Throttle Position	Transmission Type & Gear		No. of Vehicles	% of Vehicles
-------------------------Automatic Transmission-------------------------				
Maximum	4-Speed:	4th	61	19.6
		3rd	44	14.1
		2nd	25	8.0
	3-Speed:	3rd	113	36.2
		2nd	47	15.1
Part	4-Speed:	4th	8	2.6
		3rd	2	0.6
	3-Speed	3rd	12	3.8
			312*	100.0
-------------------------Manual Transmission-------------------------				
Maximum	5-Speed:	4th	31	50.8
		3rd	7	11.5
		2nd	1	1.6
	4-Speed:	4th	10	16.4
		3rd	4	6.6
	3-Speed:	3rd	1	1.6
Part	5-Speed:	4th	6	9.9
		3rd	1	1.6
	4-Speed:	4th	0	0.0
			61	100.0

* Four test vehicles not counted, because all FBRU fuels satisfied their octane number requirements.

FIGURE 1

DISTRIBUTION OF ODOMETER MILEAGE
FOR 1986 MODEL VEHICLES TESTED

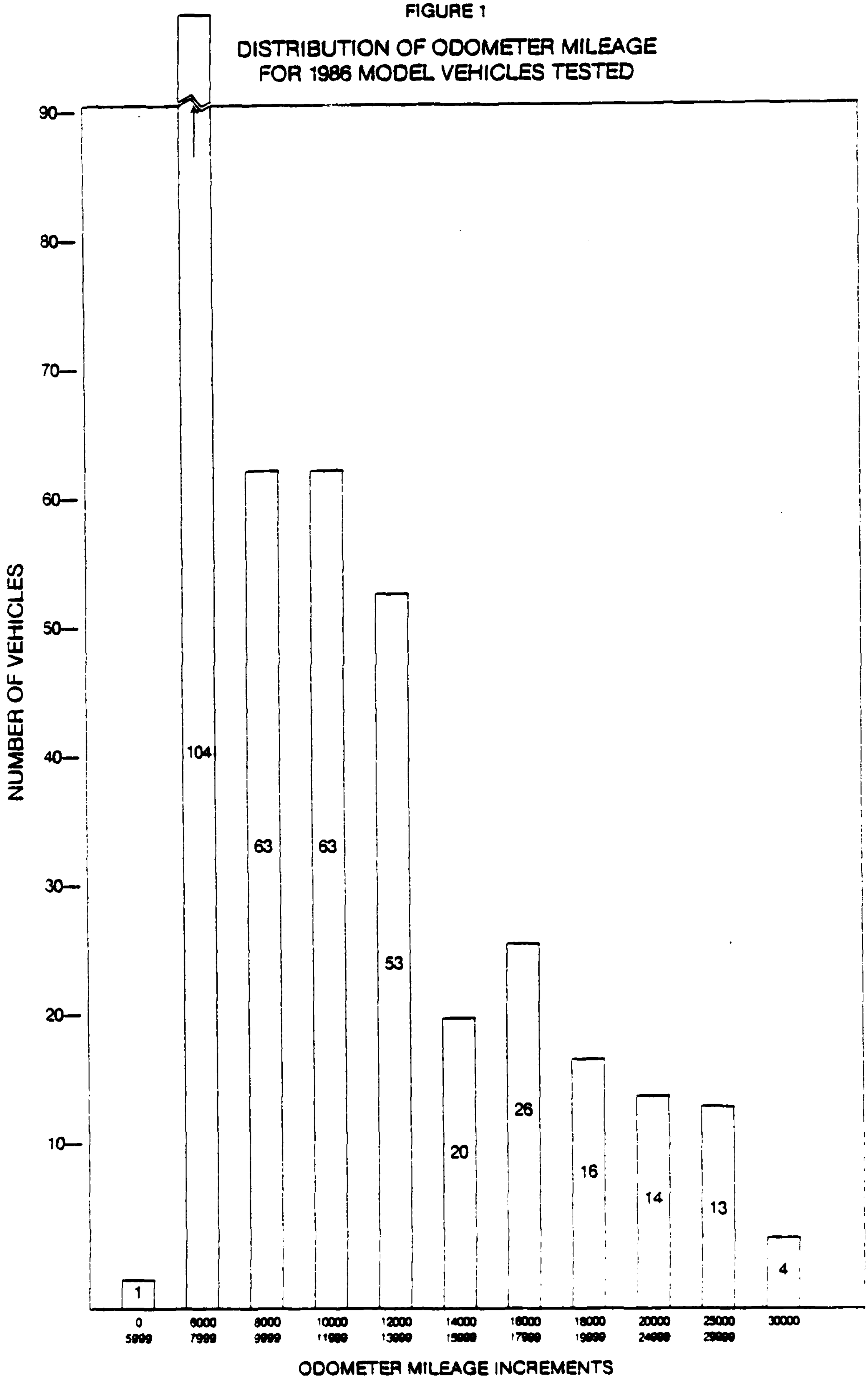


FIGURE 2

DISTRIBUTION OF MAXIMUM PR FUEL REQUIREMENTS
1986 U. S. AND IMPORTED VEHICLES

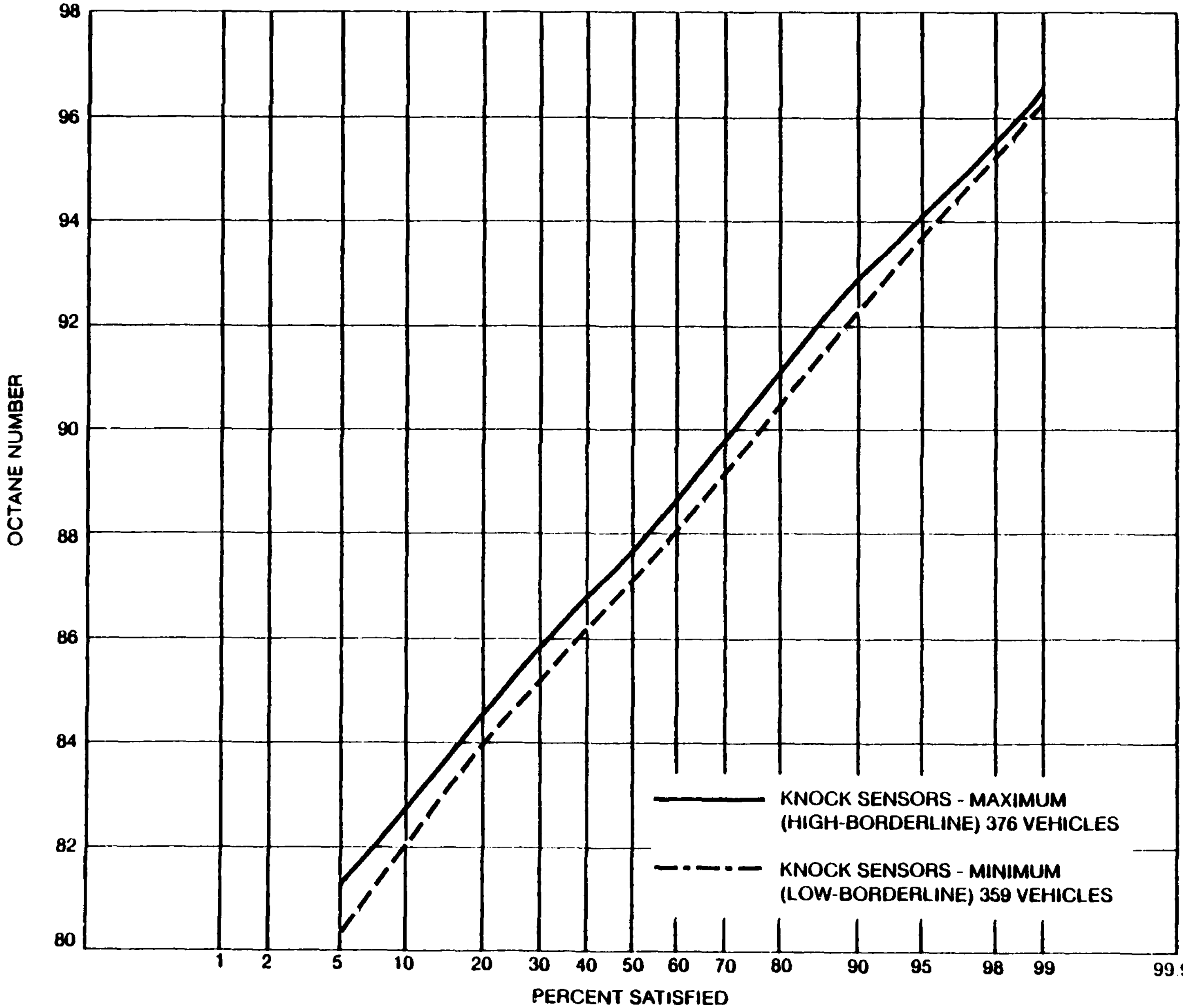


FIGURE 3

DISTRIBUTION OF MAXIMUM FBRU (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 U. S. AND IMPORTED VEHICLES

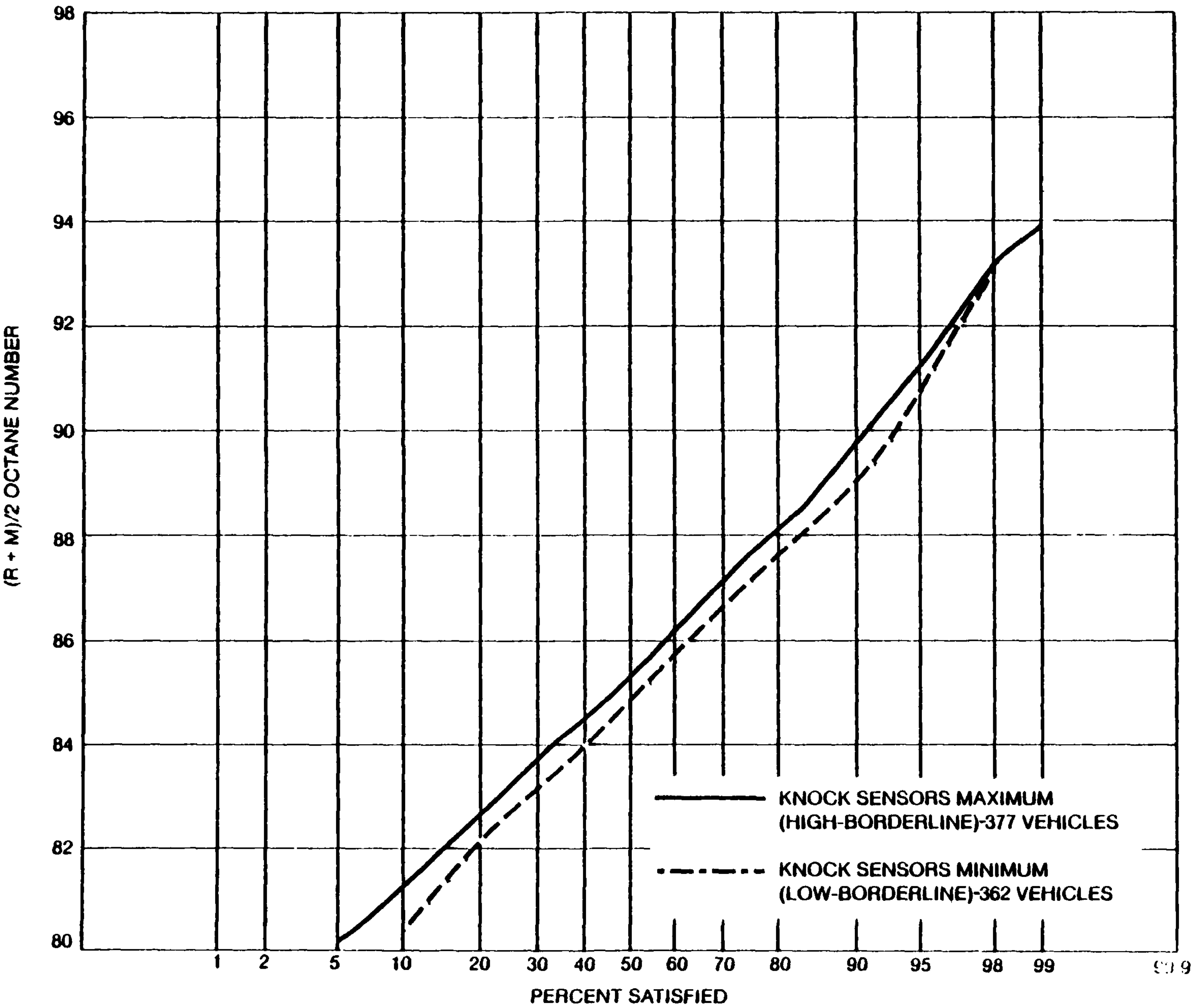


FIGURE 4

DISTRIBUTION OF MAXIMUM FBRSU (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 U. S. AND IMPORTED VEHICLES

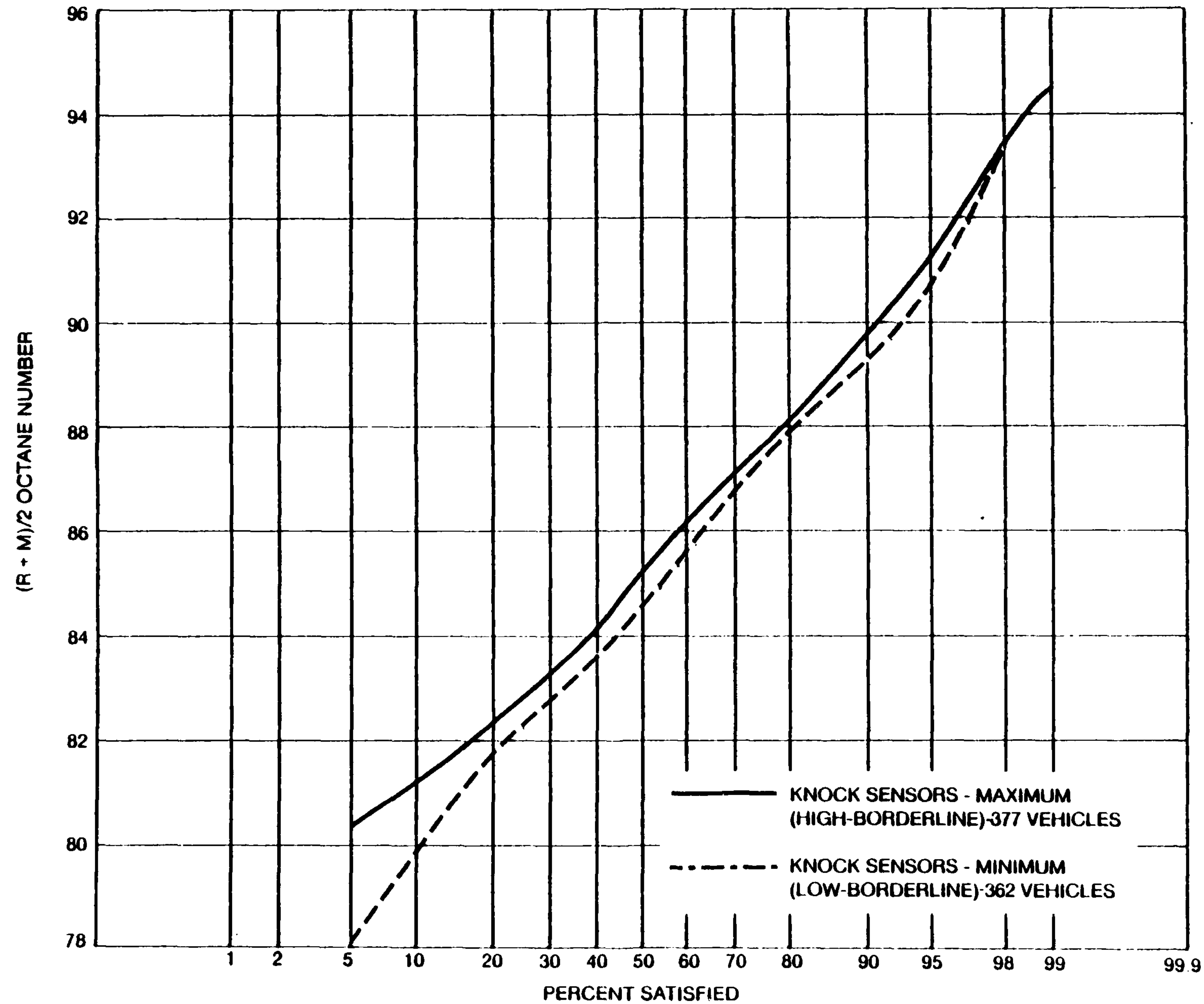


FIGURE 5

DISTRIBUTION OF MAXIMUM (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 U. S. AND IMPORTED VEHICLES

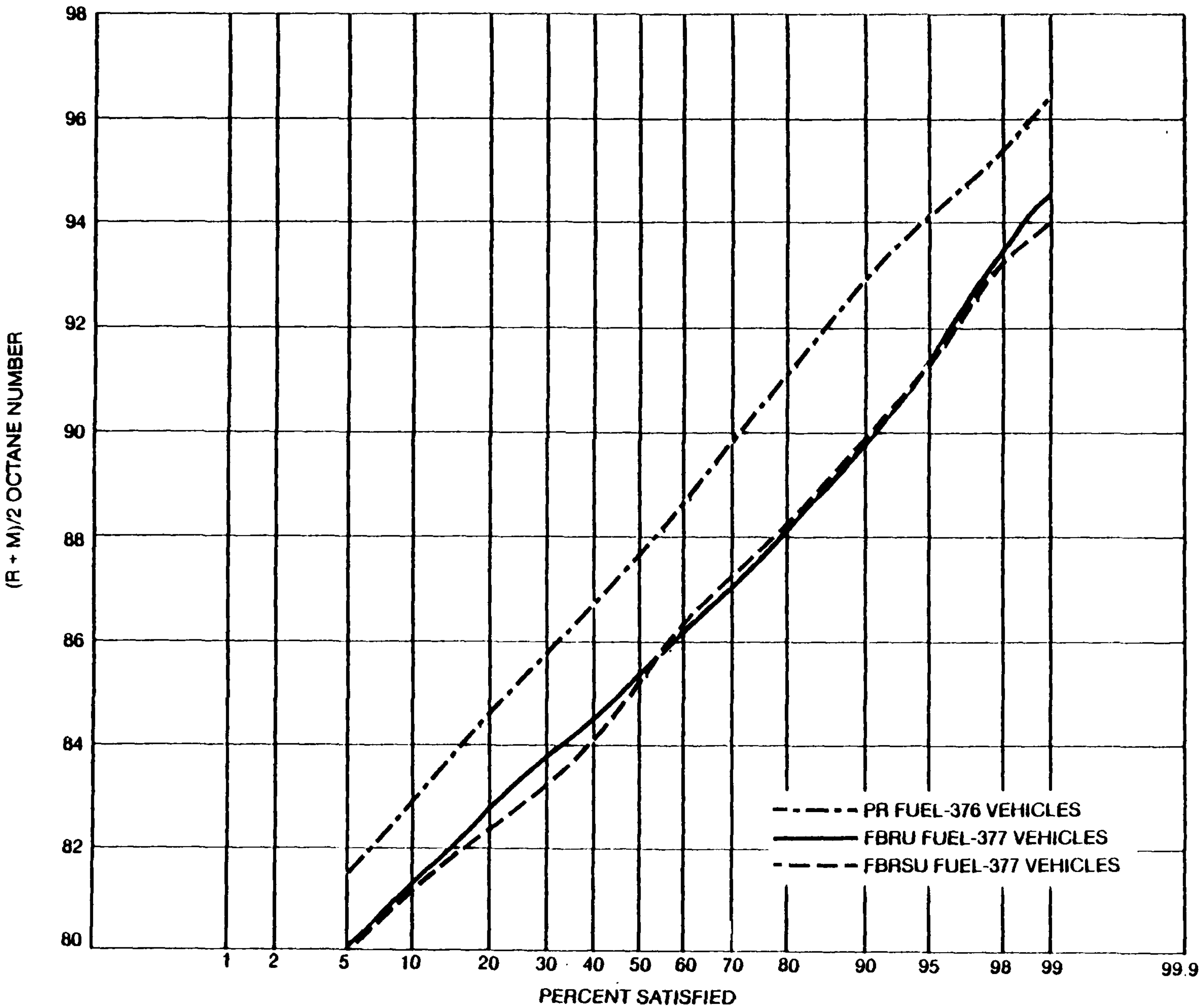


FIGURE 6

COMPARISON OF MAXIMUM FBRU (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 AND 1985 U. S. AND IMPORTED VEHICLES

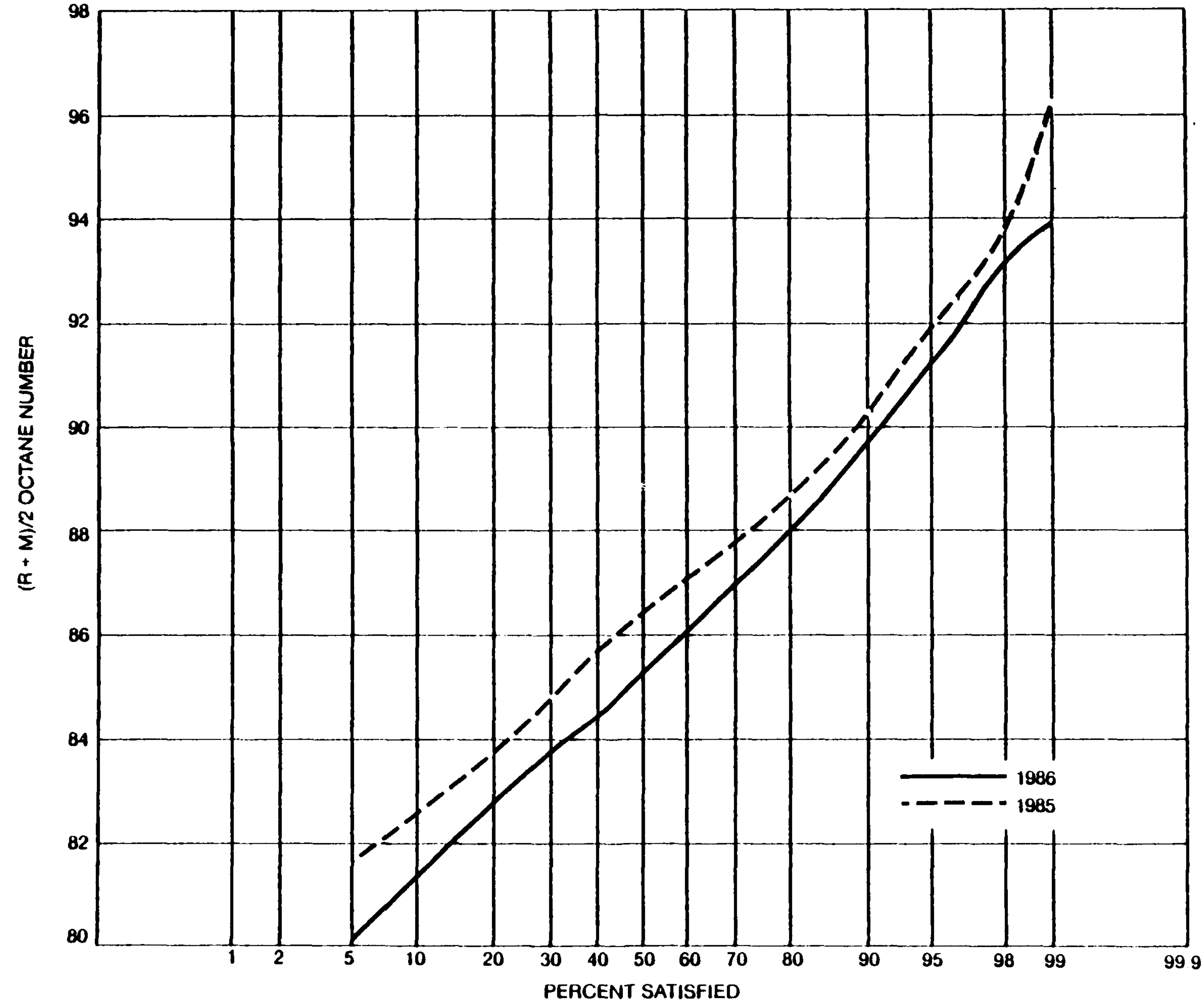


FIGURE 7

DISTRIBUTION OF MAXIMUM (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 U. S. AND IMPORTED CARS

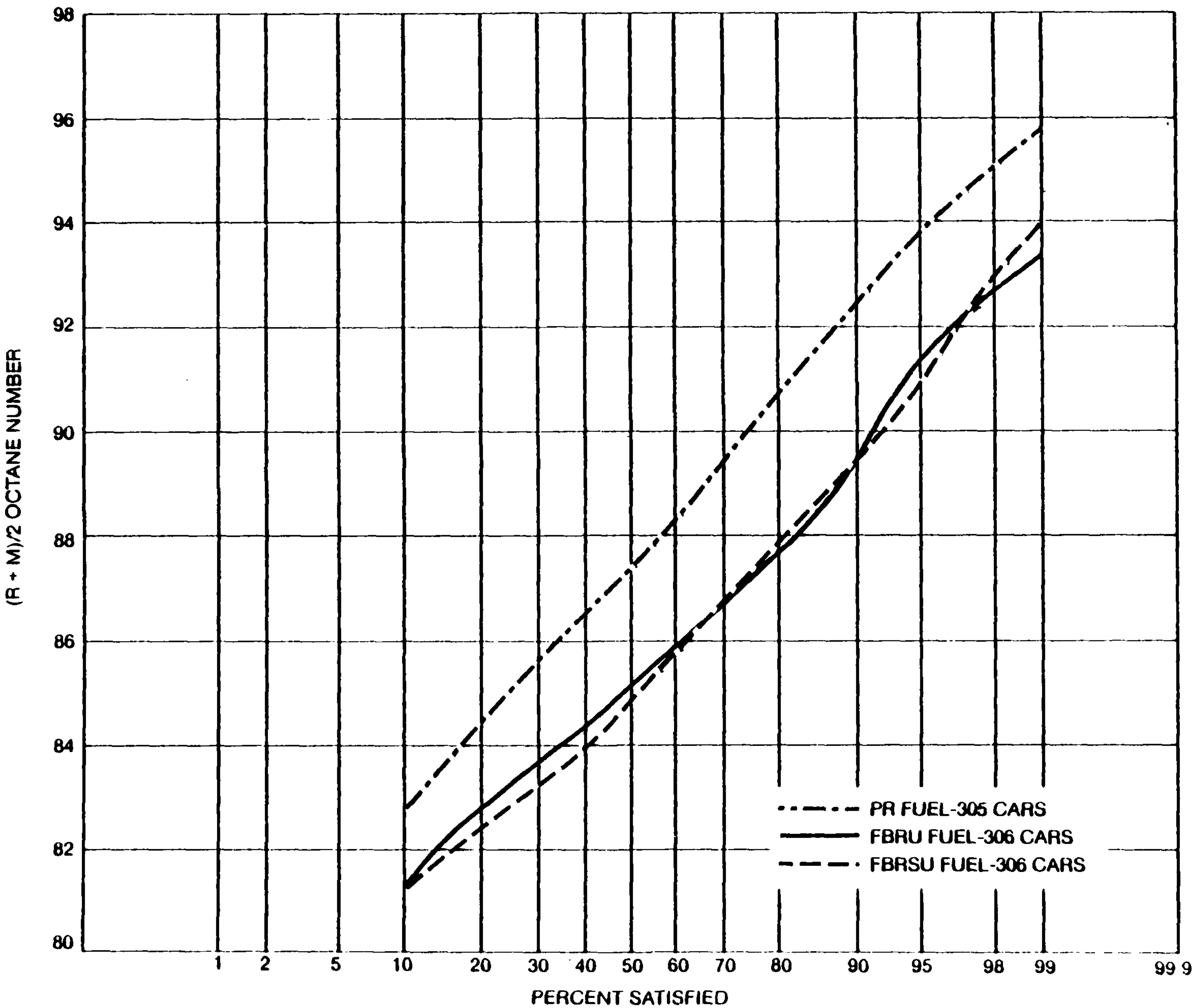


FIGURE 8

DISTRIBUTION OF MAXIMUM (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 U. S. VEHICLES

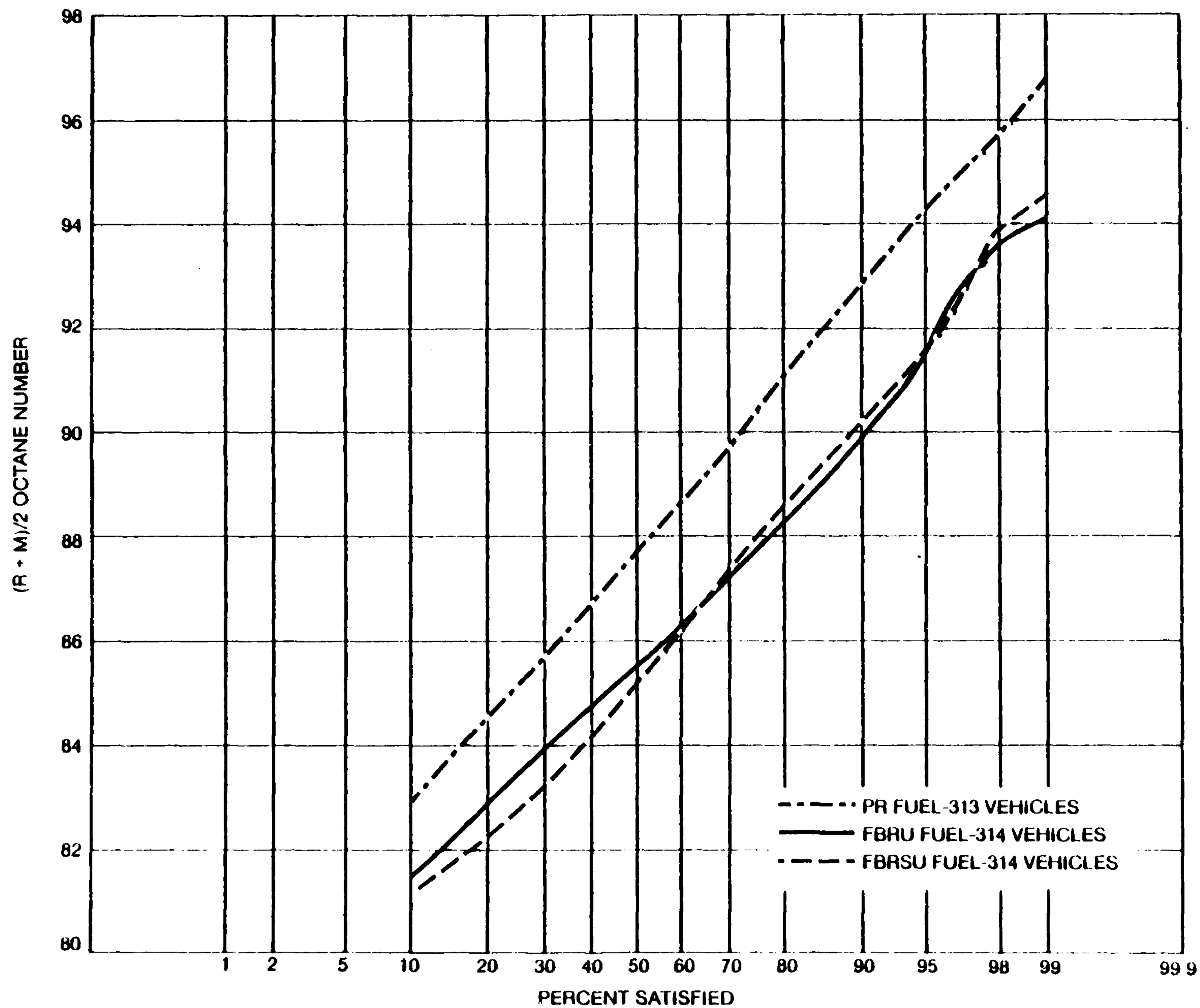


FIGURE 9

DISTRIBUTION OF MAXIMUM (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 U. S. CARS

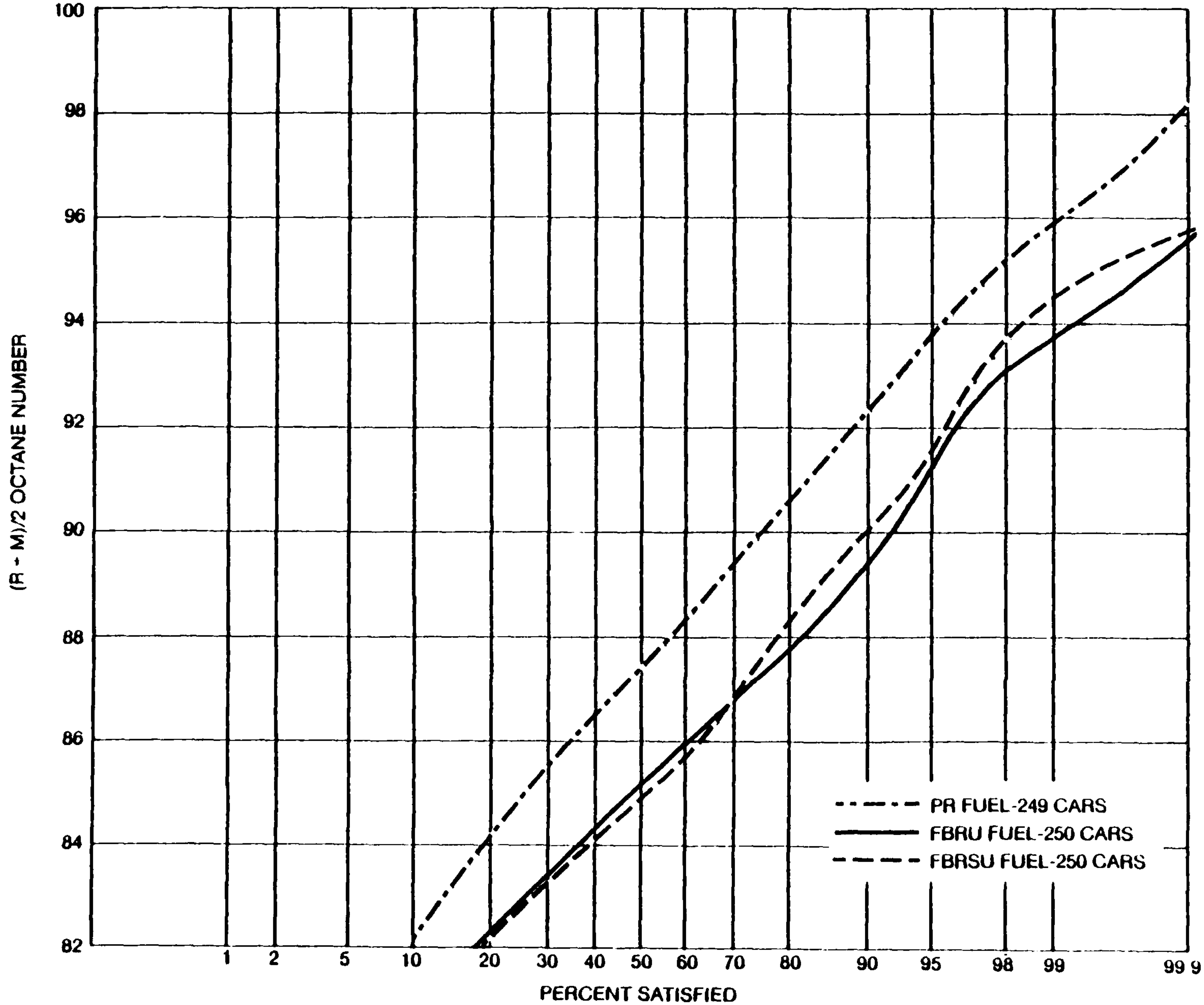


FIGURE 10

DISTRIBUTION OF MAXIMUM (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 IMPORTED VEHICLES

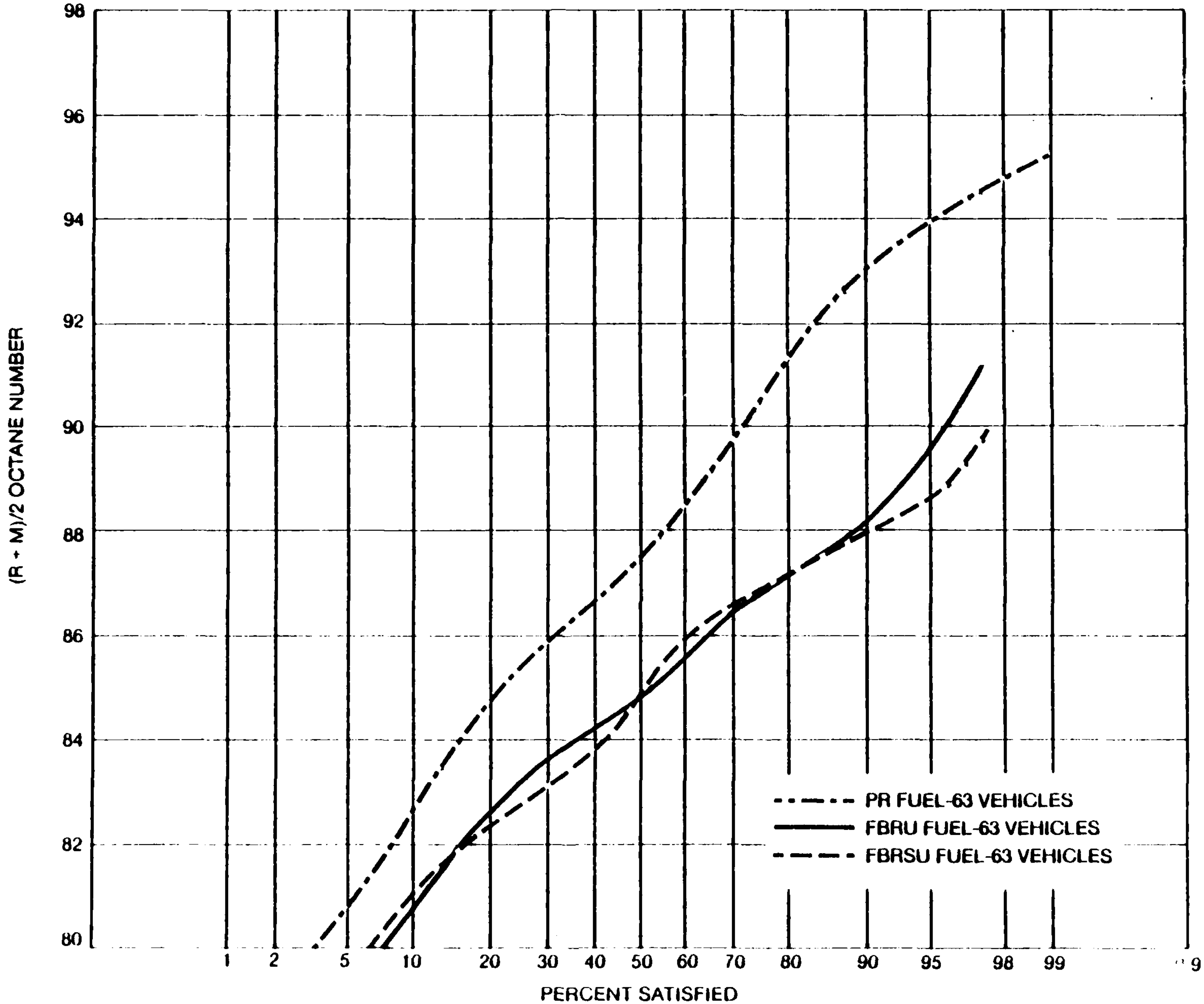


FIGURE 11

DISTRIBUTION OF MAXIMUM (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 U.S. AND IMPORTED KNOCK-SENSOR VEHICLES ONLY
MAXIMUM (HIGH-BORDERLINE)

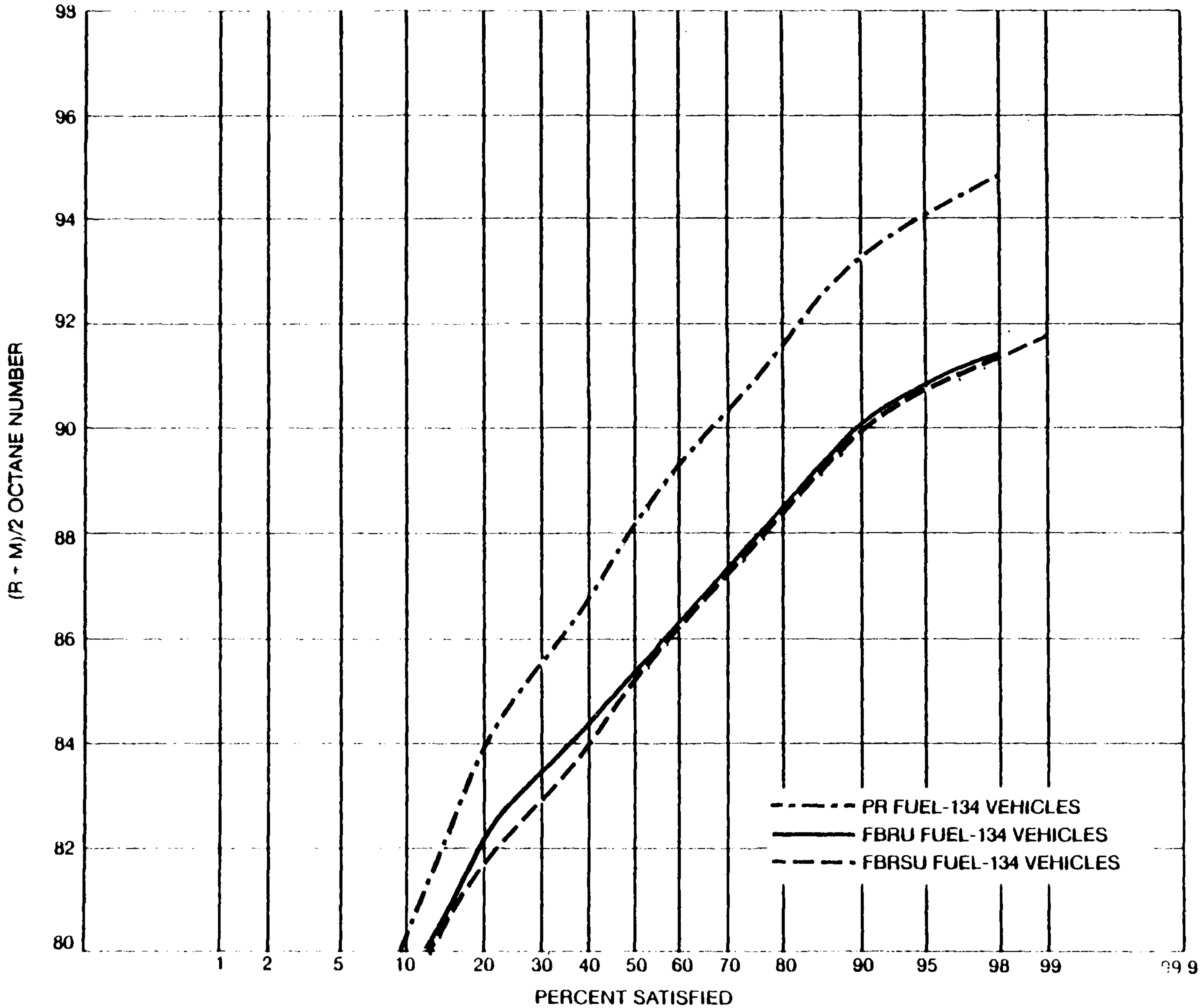


FIGURE 12

DISTRIBUTION OF MAXIMUM (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 U.S. AND IMPORTED KNOCK-SENSOR VEHICLES ONLY
MINIMUM (LOW-BORDERLINE)

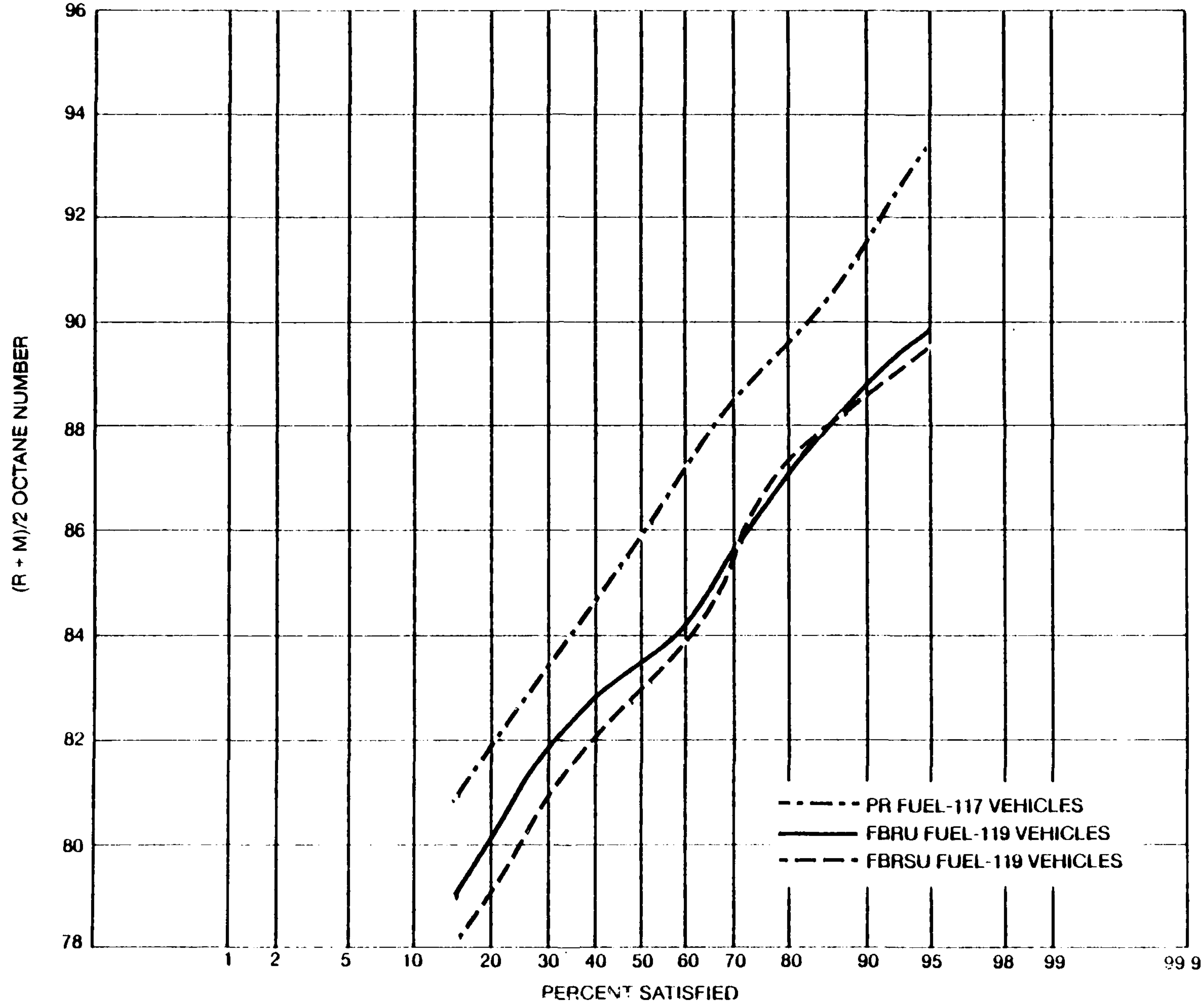
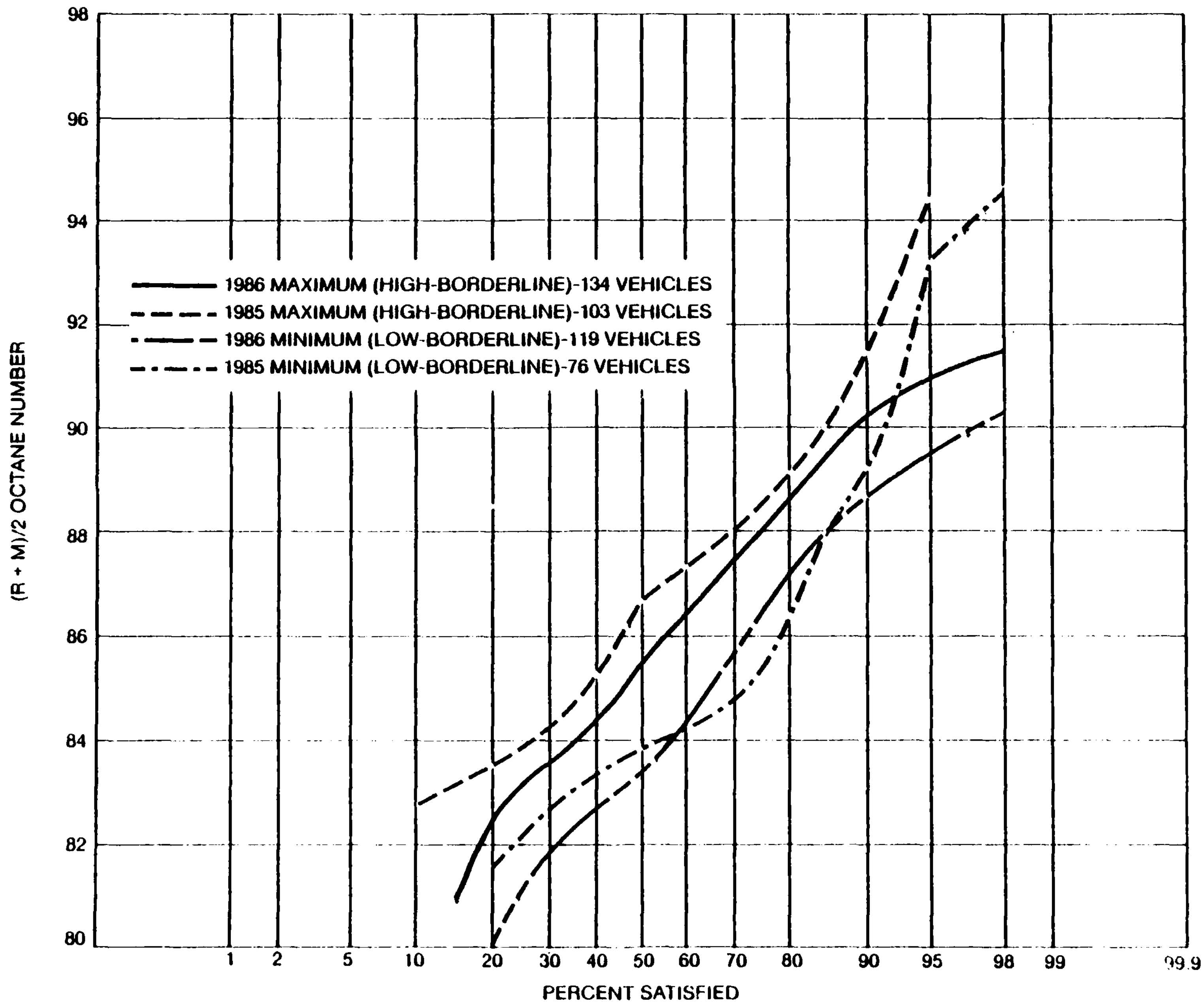


FIGURE 13

COMPARISON OF MAXIMUM FBRU (R + M)/2 OCTANE NUMBER REQUIREMENTS
1986 and 1985 U. S. AND IMPORTED KNOCK-SENSOR VEHICLES ONLY



APPENDIX A

PARTICIPATING LABORATORIES

PARTICIPATING LABORATORIES

No. of Vehicles Tested	Eastern Area	East Central Area	No. of Vehicles Tested
20	Exxon Res. & Engrg. Co. Linden, NJ	Ford Motor Company Dearborn, MI	29
30	Mobil Res. & Dev. Corp. Paulsboro, NJ	General Motors Corp. Warren, MI	30
29	Sun Company Marcus Hook, PA	Nissan Res. & Dev. Ann Arbor, MI	10
30	Texaco Inc. Beacon, NY	Petro-Canada Products Sheridan Park, Ontario	29
		Shell Canada Oakville, Ontario	10
		Sohio Oil Co. Cleveland, OH	17
		Toyota Motor Corp. Ann Arbor, MI	10

	Western Area	West Central Area	
30	Chevron Research Company Richmond, CA	Amoco Oil Company Naperville, IL	31
29	Unocal Corporation Brea, CA	Phillips Petroleum Co. Bartlesville, OK	13
		Shell Development Co. Houston, TX	30

1986 CRC OCTANE NUMBER REQUIREMENT SURVEY

1986 ANALYSIS PANEL

Name	Company
M. J. McNally, Leader	Mobil Research and Development Company
W. F. Biller	Consultant
D. I. Hoel	Exxon Research and Engineering Company
J. C. Callison	Amoco Oil Company
L. A. Freedman	Mobil Oil Corporation
J. P. Uihlein	Sohio Oil Company
R. A. Wirth	Sun Refining & Marketing Company
T. Wusz	Unocal Corporation

APPENDIX C

DATA ON 1985/1986
FULL-BOILING RANGE REFERENCE FUELS

TABLE C-I

SUPPLIERS' FUEL INSPECTIONS

1985/1986 FBRU FUELS

	Low-Octane Base Blend RMFD 356-85/86	Intermediate-Octane Base Blend RMFD 357-85/86	High-Octane Base Blend RMFD 358-85/86
Laboratory Inspection			
Distillation, °F			
IBP	91	93	94
10% Evap.	120	124	126
30% Evap.	153	154	186
50% Evap.	195	198	238
70% Evap.	230	251	255
90% Evap.	313	337	291
End Point	388	399	377
Gravity, °API	67.0	62.8	52.3
RVP, psi	8.6	7.6	8.1
Lead, g/gal.	<0.03	<0.03	<0.03
Oxidation Stab., hr.	>24	>24	>24
Hydrocarbon Type, Vol. %			
Aromatics	22	27	55
Olefins	5	10	1
Saturates	73	63	44
Research Octane Number	76.6	90.3	103.5
Motor Octane Number	72.7	82.0	92.3
Sensitivity	3.8	8.3	11.2

TABLE C-II

OCTANE NUMBERS AND COMPOSITIONS FOR 1985/1986 FBRU FUELS

RON	Blending Data Composition, Volume Percent RMFD 356-85/86	RMFD 357-85/86	RMFD 358-85/86	MON	Sensitivities 1985
78	92	8	--	73.8	4.2
80	78	22	--	75.4	4.6
82	64	36	--	76.9	5.1
84	49	51	--	78.4	5.6
85	42	58	--	79.0	6.0
86	34	66	--	79.6	6.4
87	26	74	--	80.3	6.7
88	18	82	--	80.8	7.2
89	11	89	--	81.3	7.7
90	3	97	--	81.9	8.1
91	--	95	5	82.5	8.5
92	--	88	12	83.0	9.0
93	--	81	19	83.6	9.4
94	--	73	27	84.3	9.7
95	--	65	35	85.1	9.9
96	--	57	43	85.7	10.3
97	--	49	51	86.5	10.5
98	--	41	59	87.2	10.8
99	--	33	67	88.1	10.9
100	--	24	76	89.0	11.0
101	--	16	84	89.9	11.1
102	--	9	91	90.8	11.2
103	--	0	100	92.2	10.8

TABLE C-III

SUPPLIERS' FUEL INSPECTIONS

1985/1986 FBRSU FUELS

	Low-Octane Base Blend RMFD 359-85/86	Intermediate-Octane Base Blend RMFD 360-85/86	High-Octane Base Blend RMFD 361-85/86
Laboratory Inspection			
Distillation, °F			
IBP	92	92	92
10% Evap.	127	126	126
30% Evap.	173	169	179
50% Evap.	207	229	231
70% Evap.	246	283	253
90% Evap.	345	352	298
End Point	400	414	424
Gravity, °API	63.3	57.5	45.8
RVP, psi	8.4	7.5	7.9
Lead, g/gal.	<0.03	<0.03	<0.03
Oxidation Stab., hr.	>24	>24	>24
Hydrocarbon Type, Vol. %			
Aromatics	37	44	62
Olefins	7	13	2
Saturates	56	43	36
Research Octane Number	77.3	90.8	103.8
Motor Octane Number	71.5	80.5	90.3
Sensitivity	5.7	10.3	13.5

TABLE C-IV

OCTANE NUMBERS AND COMPOSITIONS FOR 1985/1986 FBRSU FUELS

	Blending Data Composition, Volume Percent				Sensitivities
RON	RMFD 359-85/86	RMFD 360-85/86	RMFD 361-85/86	MON	1985
78	97	3	--	71.5	6.5
80	84	16	--	73.3	6.7
82	70	30	--	74.6	7.4
84	54	46	--	76.1	7.9
85	47	53	--	76.8	8.2
86	39	61	--	77.5	8.5
87	32	68	--	78.0	9.0
88	24	76	--	78.6	9.4
89	16	84	--	79.2	9.8
90	7	93	--	79.8	10.2
91	--	99	1	80.3	10.7
92	--	92	8	80.9	11.1
93	--	85	15	81.6	11.4
94	--	78	22	82.3	11.7
95	--	71	29	83.0	12.0
96	--	63	37	83.8	12.2
97	--	54	46	84.7	12.3
98	--	46	54	85.5	12.5
99	--	38	62	86.2	12.8
100	--	29	71	87.0	13.0
101	--	20	80	87.9	13.1
102	--	11	89	88.9	13.1
103	--	1	99	90.0	13.0

APPENDIX D

PROGRAM

APPENDIX D

COORDINATING RESEARCH COUNCIL
INCORPORATED
219 PERIMETER CENTER PARKWAY
ATLANTA, GEORGIA 30346
(404) 396-3400

PROGRAM

for the

1986 CRC OCTANE NUMBER REQUIREMENT SURVEY

CRC Project No. CM-123-86

December 1985

TABLE OF CONTENTS

I. INTRODUCTION

The 1986 program of the CRC Light-Duty Octane Number Requirement Survey Group will consist of a survey of the octane number requirements of 1986 model domestic and imported vehicles. For the purposes of this program, the designation "passenger vehicles" will include passenger cars, light-duty (<8500 lb/3856 kg GVW) pickup trucks, and vans. Approximately 400 vehicles will be tested. Most of these vehicles will be sampled in proportion to their relative production or import volume, to provide data from which to estimate the distribution of octane number requirements for the 1986 model vehicle population in the United States. In addition, select models of special interest will be tested in sufficient numbers to estimate their requirement distributions.

Knocking characteristics will be investigated with three series of reference fuels. Tank fuel knock will also be evaluated. Maximum octane number requirements, whether at maximum-throttle or part-throttle, will be established for each vehicle using high sensitivity unleaded full-boiling range reference (FBRSU) fuels, average sensitivity unleaded full-boiling range reference (FBRU) fuels, and primary reference (PR) fuels. If the maximum requirement is at maximum-throttle, then part-throttle requirements are investigated with only FBRU fuels of up to, and including, four octane numbers lower than the maximum requirement. Also, minimum requirements are determined for knock sensor-equipped vehicles.

II. GEOGRAPHICAL AREAS

As in previous years, the 1986 Survey will be conducted on a nationwide basis. The country has been divided into four geographical areas. Participants located in New York, New Jersey, Delaware, and Pennsylvania have been included in the Eastern Area; those located in Ohio, Michigan, and Kentucky comprise the East Central Area; those in Illinois, Texas, and Oklahoma comprise the West Central Area; and California participants make up the Western Area. A coordinator has been appointed for each area as follows:

Eastern Area........................R. A. Bouffard
East Central Area..................C. P. Sherwood
West Central Area..................J. B. Baker
Western Area.......................T. Wusz

The area coordinators will contact their area participants periodically regarding the progress of the survey. To expedite this, it is suggested that participants send copies of all correspondence concerning the survey to the area coordinators. This program outlines the survey in broad terms. If more detailed information is desired, it is suggested that the participant contact his area coordinator.

III. VEHICLES

A total of approximately 450 vehicles will be tested in the 1986 Survey. Current experience indicates we can expect 11 full participants and 5 partial participants. By assigning 30 cars per full participant, 70 cars for the partial participants, and 50 vehicles to be tested under contract, the 450-car total is obtained. These will be divided into two groups: (1) the statistical group, sampled in proportion to US car model production or import volume, and (2) select models of special interest. Approximately 20 of each of these select models are assigned to be tested in order to provide an estimate of the octane requirement distribution of each model. Some of these 20 vehicles will be those already included in the statistical group, and the remainder will be additional vehicles added to the program.

The desired number of vehicles to be tested in each category is as follows:

Statistical Group	400
Additional Select Model Group	50
Total	450

A detailed breakdown of the specific models and the number of each model to be tested will be circulated to the participants in May 1986 after an estimate of vehicle model production has been obtained. Design specifications for select models to be tested in the 1986 Survey are shown in Table D-I. Selection of these vehicles has been based on new or modified design characteristics that might have a significant effect on octane number requirements and high sales volume which allows individual treatment without additional testing.

Wherever possible, specific vehicle assignments to individual participating laboratories will be made in a pattern which tends to minimize data bias. This will be accomplished by apportioning cars of a given model among the four geographical areas, and subsequently among the laboratories within each area, in order to minimize the effect of nonrandom factors on the results of the Survey. Cars tested under contract will be assigned to the region where the contracting laboratory is located.

IV. FUELS

A. Full-Boiling Range Reference Fuels

Two full-boiling range reference fuel series will be used to define the vehicle octane number requirements. The two series will be unleaded and of varying sensitivity. One series will be comparable to the average sensitivity of unleaded commercial fuels (FBRU); the other series (FBRSU) will be a minimum of two numbers higher in sensitivity than the FBRU fuels. The Research octane number (RON) range for both fuel series is 77 to 104.

The two series will be blended in increments of two RON up to 84, and one RON above 84 from three base fuels for each series. The base fuels are compounded from normal refinery gasoline components. Limiting specifications for each base fuel for both series are shown in Table D-II. These specifications apply to both the 1985 and 1986 Surveys.

Research and Motor ratings have been determined for incremental blends of each fuel series by participants to provide data for establishment of blending curves. The average ratings and blending curves are given in Tables D-III, D-IV, and D-V.

B. Primary Reference Fuels

Blends of ASTM-grade isooctane and normal heptane will be prepared in two octane number increments from 76 to 82, and one octane number increments from 82 to 100.

C. Tank Gasoline

Research and Motor octane ratings will be obtained only on gasoline samples from the tank of vehicles with owner questionnaire (Attachment 1). Owner's Questionnaire should be obtained only if:

a) vehicle has a regular driver;

b) the ignition timing is within ± 2° of the manufacturer's specifications.

V. TEST TECHNIQUE

All tests are to be conducted using the technique entitled, "Technique for Determination of Octane Number Requirements of Light-Duty Vehicles" (CRC Designation E-15-86). A copy of this technique is included as Attachment 2 to this program. Octane number requirement investigations are to be conducted in all vehicles under level road conditions. Any vehicle obviously in poor mechanical condition or with malfunctioning emission control devices should not be considered for test work. The vehicles must have a minimum of 6000 deposit miles (9656 km), and preferably be privately owned and operated. Data with less than 6000 miles will not be analyzed. Vehicles previously used for fuel road octane rating must not be employed in this survey.

Data should be reported on each vehicle tested, even though knock was not encountered on any of the fuels.

The order in which the fuels are to be tested is as follows:

1) Tank fuel;
2) FBRSU;
3) FBRU;
4) PR.

VI. DATA FORMS

The test results on each vehicle will be reported on data forms DFMF-11-1186, DFMF-12-1186, and DFMF-19-1186. For knock sensor-equipped vehicles, data forms should be filled out completely for maximum and minimum requirements. Copies of these forms will be mailed to all participants from the CRC office with instructions for their use. Additional instructions are included in the E-15-86 technique.

VII. REPORTING RESULTS

The original data forms for each vehicle tested should be submitted to the Coordinating Research Council, Inc., 219 Perimeter Center Parkway, Atlanta, Georgia 30346, as soon as possible, but not later than October 31, 1986.

TABLE D-I

DESIGN SPECIFICATIONS FOR 1986 SELECT MODELS

Make & Model	Engine Displ. Litres	Configuration & No. of Cylinders	Fuel System	Comp. Ratio	BHP	VIN Engine Code	Transmission Type
Plymouth Reliant Dodge Aries	2.2	4	TBI	9.5	97	-	A3
Plymouth Reliant Dodge Aries	2.5	4	TBI	9.1	100	D	A3
Ford Taurus Mercury Sable	3.0	V6	EFI	9.25	140	U	A4
Ford Escort Mercury Lynx	1.9	4	2V	9.0	86	9	M5
GM (C/H/E Cars) Olds 98/Electra/ Toronado/Riviera/ Olds Delta/LeSabre	3.8	V6	MFI	8.5	150	B	A4
GM (A Cars) Celebrity/P-6000 Ciera/Century	2.8	V6	MFI	8.4	130	W	A3

TABLE D-II

LIMITING SPECIFICATIONS FOR 1985 AND 1986 FULL-BOILING RANGE REFERENCE FUELS*

Inspection Tests	Unleaded Average Sensitivity Reference Fuels (FBRU)				Unleaded High Sensitivity Reference Fuels (FBRSU)		
	RMFD 356		RMFD 357	RMFD 358	RMFD 359	RMFD 360	RMFD 361
ASTM Distillation, °F(°C)							
IBP, Min.	90	(32.2)	90	90	90	90	90
10% Evap.	115-158	(46.1- 70.0)	115-158	115-158	115-158	115-158	115-158
30% Evap.	150-190	(65.6- 87.8)	150-190	150-190	150-190	150-190	150-190
50% Evap.	195-250	(90.6-121.1)	195-250	195-250	195-250	195-250	195-250
70% Evap.	230-300	(110.0-148.9)	230-300	230-300	230-300	230-300	230-300
90% Evap.	285-374	(140.6-190.0)	285-374	285-374	285-374	285-374	285-374
End Point, Max.	437	(225)	437	437	437	437	437
RVP, psi (KPa)	7-9	(48-62)	7-9	7-9	7-9	7-9	7-9
Lead, g/gal (g/l)	<0.03	(<0.008)	<0.03	<0.03	<0.03	<0.03	<0.03
Oxidation Stability, Minutes, Min.	1440		1440	1440	1440	1440	1440
Hydrocarbon Type, Vol. %							
Aromatics, Max.**	20		35	55	35	45	65
Olefins, Max.	20		15	10	35	25	15
Saturates	Remainder		Remainder	Remainder	Remainder	Remainder	Remainder
Octane Number							
Research	77 ± 1		90 ± 1	104 ± 1	77 ± 1	90 ± 1	104 ± 1
Sensitivity***	4.0 ± .5		8.2 ± .5	11.5 ± .5	6.0 ± .5	10.2 ± .5	13.5 ± .5
Minimum of <u>two units</u> sensitivity difference between corresponding fuels of each series.							
Color	Clear		Green	Red	Yellow	Deep Purple	Light Blue

<u>Note</u>: All fuels to contain *minimum* 5 PTB of *a* 100% active antioxidant and 10 PTB of corrosion inhibitor. No manganese added.

Confirmation of product quality of fuel blends to be approved by a six-laboratory CRC Fuel Acceptance Panel prior to drumming.

* To be compounded from normal refinery components. Oxygenates are not to be used as fuel components.

** 1% maximum Benzene or legal.

*** Sensitivities are shown for the mean Research octane number.

TABLE D-III

OCTANE NUMBERS AND COMPOSITIONS

FOR 1985-86 FBRU FUELS

RON	Volume Percent RMFD-356	RMFD-357	RMFD-358	MON	SENSITIVITY
78	92	8	--	73.8	4.2
80	78	22	--	75.4	4.6
82	64	36	--	76.9	5.1
84	49	51	--	78.4	5.6
85	42	58	--	79.0	6.0
86	34	66	--	79.6	6.4
87	26	74	--	80.3	6.7
88	18	82	--	80.8	7.2
89	11	89	--	81.3	7.7
90	3	97	--	81.9	8.1
91	--	95	5	82.5	8.5
92	--	88	12	83.0	9.0
93	--	81	19	83.6	9.4
94	--	73	27	84.3	9.7
95	--	65	35	85.1	9.9
96	--	57	43	85.7	10.3
97	--	49	51	86.5	10.5
98	--	41	59	87.2	10.8
99	--	33	67	88.1	10.9
100	--	24	76	89.0	11.0
101	--	16	84	89.9	11.1
102	--	9	91	90.8	11.2
103	--	0	100	92.2	10.8

TABLE D-IV

OCTANE NUMBERS AND COMPOSITIONS

FOR 1985-86 FBRSU FUELS

RON	Volume Percent RMFD-359	RMFD-360	RMFD-361	MON	SENSITIVITY
78	97	3	--	71.5	6.5
80	84	16	--	73.3	6.7
82	70	30	--	74.6	7.4
84	54	46	--	76.1	7.9
85	47	53	--	76.8	8.2
86	39	61	--	77.5	8.5
87	32	68	--	78.0	9.0
88	24	76	--	78.6	9.4
89	16	84	--	79.2	9.8
90	7	93	--	79.8	10.2
91	--	99	1	80.3	10.7
92	--	92	8	80.9	11.1
93	--	85	15	81.6	11.4
94	--	78	22	82.3	11.7
95	--	71	29	83.0	12.0
96	--	63	37	83.8	12.2
97	--	54	46	84.7	12.3
98	--	46	54	85.5	12.5
99	--	38	62	86.2	12.8
100	--	29	71	87.0	13.0
101	--	20	80	87.9	13.1
102	--	11	89	88.9	13.1
103	--	1	99	90.0	13.0

TABLE D-V

CRC 1985-86 FULL BOILING REFERENCE RATING FUELS

Variable	N	Mean	Standard Deviation	Minimum Value	Maximum Value
BLEND=ASU					
RON	10	77.66	0.53	76.80	78.30
MON	10	71.87	0.68	70.60	72.70
S	9	5.74	0.79	4.50	6.70
BLEND=AU					
RON	9	76.69	0.33	76.20	77.10
MON	10	72.88	0.48	72.10	73.60
S	9	3.82	0.41	3.20	4.30
BLEND=BSU					
RON	10	80.61	0.32	80.00	81.00
MON	10	73.73	0.68	72.60	74.60
S	9	6.96	0.81	5.80	8.10
BLEND=BU					
RON	8	79.76	0.38	79.20	80.20
MON	10	75.19	0.44	74.40	75.90
S	8	4.55	0.50	3.60	5.00
BLEND=CSU					
RON	10	83.23	0.33	82.80	83.80
MON	10	75.65	0.67	74.50	76.60
S	9	7.67	0.71	6.60	8.70
BLEND=CU					
RON	10	82.56	0.36	82.00	83.00
MON	10	77.27	0.44	76.60	78.00
S	9	5.23	0.58	4.30	5.90
BLEND=DSU					
RON	10	85.88	0.43	85.00	86.50
MON	10	77.40	0.51	76.40	78.10
S	9	8.63	0.64	7.70	9.60

TABLE D-V - Continued

CRC 1985-86 FULL BOILING REFERENCE RATING FUELS

Variable	N	Mean	Standard Deviation	Minimum Value	Maximum Value
BLEND=DU					
RON	9	85.20	0.20	85.00	85.50
MON	9	79.21	0.32	78.80	79.70
S	7	6.11	0.41	5.40	6.70
BLEND=ESU					
RON	10	88.48	0.24	88.10	88.80
MON	10	78.89	0.47	78.20	79.80
S	9	9.68	0.53	8.60	10.30
BLEND=EU					
RON	9	87.81	0.15	87.60	88.00
MON	10	80.71	0.39	80.00	81.30
S	9	7.12	0.49	6.40	8.00
BLEND=FSU					
RON	10	90.78	0.24	90.30	91.10
MON	9	80.23	0.28	79.70	80.60
S	8	10.61	0.40	10.00	11.30
BLEND=FU					
RON	9	90.30	0.10	90.20	90.50
MON	10	82.12	0.34	81.70	82.80
S	8	8.16	0.43	7.50	8.70
BLEND=GSU					
RON	9	93.72	0.23	93.40	94.00
MON	10	82.15	0.32	81.50	82.50
S	9	11.58	0.27	11.20	12.10
BLEND=GU					
RON	9	93.10	0.15	92.90	93.40
MON	10	83.74	0.33	83.40	84.50
S	9	9.33	0.37	8.50	9.70

TABLE D-V - Continued

CRC 1985-86 FULL BOILING REFERENCE RATING FUELS

Variable	N	Mean	Standard Deviation	Minimum Value	Maximum Value
BLEND=HSU					
RON	9	96.32	0.16	96.10	96.60
MON	10	84.09	0.32	83.70	84.70
S	9	12.22	0.34	11.70	12.70
BLEND=HU					
RON	10	95.69	0.33	94.90	96.10
MON	10	85.61	0.31	85.00	86.00
S	9	10.13	0.36	9.70	10.80
BLEND=ISU					
RON	10	98.65	0.23	98.30	98.90
MON	10	85.96	0.33	85.40	86.40
S	9	12.70	0.29	12.30	13.20
BLEND=IU					
RON	10	98.22	0.19	98.00	98.50
MON	10	87.39	0.34	86.60	87.80
S	9	10.80	0.39	10.30	11.50
BLEND=JSU					
RON	10	100.96	0.53	100.30	101.60
MON	10	87.95	0.25	87.60	88.40
S	9	13.04	0.44	12.40	13.70
BLEND=JU					
RON	10	100.40	0.25	100.00	100.80
MON	10	89.45	0.34	88.80	89.80
S	9	10.99	0.40	10.40	11.60
BLEND=KSU					
RON	10	103.09	0.60	102.00	103.60
MON	10	90.09	0.43	89.30	90.90
S	9	13.08	0.29	12.60	13.50
BLEND=KU					
RON	10	102.94	0.57	101.80	103.50
MON	9	92.18	0.25	91.80	92.60
S	8	10.80	0.48	9.80	11.30

CRC OCTANE NUMBER REQUIREMENT SURVEY

OWNER'S QUESTIONNAIRE

OWNER:

Your vehicle is being tested for fuel octane number requirements by a Coordinating Research Council activity. To help analyze the data, we would like the person who has recently been driving the vehicle to answer the following questions:

1. What grade of unleaded fuel is now in the tank?

   ☐ Regular ☐ Premium ☐ Mixture

2. Has any engine knock (ping) been encountered with the fuel that is now in the tank?

   ☐ Yes ☐ No

3. Did you consider the knock (ping) objectionable?

   ☐ Yes ☐ No

Vehicle Make ______________________ License No. ________________

Vehicle Identification No. ____

Company Testing Vehicle ____

TECHNIQUE FOR DETERMINATION OF OCTANE NUMBER REQUIREMENTS OF LIGHT-DUTY VEHICLES

(CRC Designation E-15-86)

April 1985

TECHNIQUE FOR DETERMINATION OF OCTANE NUMBER REQUIREMENTS OF LIGHT-DUTY VEHICLES

(CRC Designation E-15-86 - Including Annex A)

A. GENERAL

The technique provides for the determination of maximum octane number requirements (and minimum octane number requirements for vehicles equipped with knock sensors), whether at maximum-throttle or part-throttle, of a vehicle in terms of borderline spark knock on two series of full-boiling range reference fuels as well as on primary reference fuels. If the maximum requirement is at maximum-throttle, then part-throttle requirements are investigated with only FBRU fuels of up to, and including, four octane numbers lower than the maximum requirement.

Knock inensity on tank fuel will be measured.

B. DEFINITION OF TERMS

The following definitions of knock, approved by the CLR and CFR Committees on June 8, 1954, have been rephrased for clarification and adaptability to current technology by the Survey Steering Panel.

1. **Spark Knock**:

   Spark knock is the noise associated with autoignition* of a portion of the fuel-air mixture ahead of the advancing flame front. It is recurrent and repeatable in terms of audibility and fuel octane quality.

2. **Knock Intensity**

   a. Borderline Knock

   This means spark knock of lowest audible intensity of at least three (3) pings, and over a range of engine speed of at least 50 rpm, all being repeatable during subsequent accelerations.

---

* Autoignition: The spontaneous ignition and the resulting very rapid reaction of a portion or all of the fuel-air mixture. The flame speed is many, many times greater than that which follows normal spark ignition. There is no time reference for autoignition.

b. No Knock

This means either no audible knock or knock less than borderline intensity.

c. Above Borderline Knock

This means spark knock of greater than borderline intensity.

3. Octane Number Requirements

a. Maximum Requirement

This is equivalent to the octane number of the highest reference fuel giving borderline knock as previously defined (the next higher fuel gives no knock). If the knock intensity with the highest fuel giving knock is above borderline, the maximum requirement shall be equivalent to the mid-point between the octane number of the fuel giving knock and that of the next higher fuel which gives no knock.

b. Minimum Requirement (for vehicles with knock sensors)

This is equivalent to the octane number of the lowest reference fuel giving borderline knock (the next lower fuel will give above borderline knock).

4. Definition of Accelerations

Accelerations are made at maximum-throttle and part-throttle conditions which are defined below:

a. Maximum-Throttle

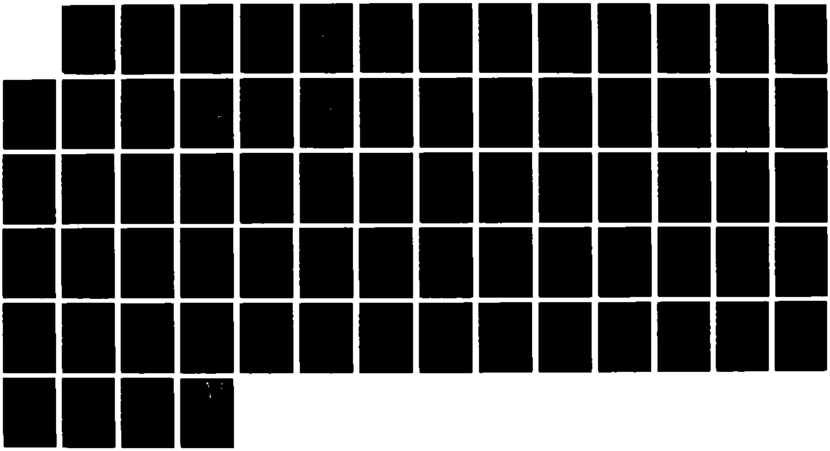
The throttle is depressed and held at either full-thrott[illegible] widest throttle position that does not cause the transm[illegible] downshift (detent) throughout the acceleration [illegible] required test gears listed in D.3.d.(1)(a). The deter[illegible] vacuum/pressure obtainable on a given model is dete[illegible] transmission characteristics. For manual tra[illegible] throttle is depressed fully throughout the acce[illegible]

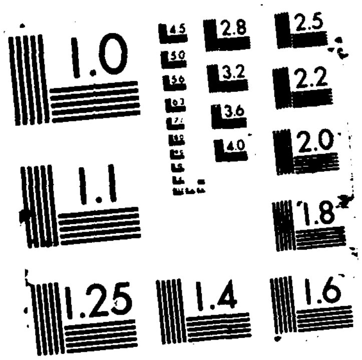
b. Part-Throttle

The throttle is depressed and regu[illegible] tion to maintain a desired [illegible] vacuum/pressure as defined [illegible]

AD-A185 703 1986 CRC (COORDINATING RESEARCH COUNCIL) OCTANE NUMBER 2/2
REQUIREMENT SURVEY(U) COORDINATING RESEARCH COUNCIL INC
ATLANTA GA AUG 87 CRC-553

UNCLASSIFIED F/G 21/7 NL




1.0
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6

C. VEHICLE PREPARATION

The following vehicle preparation steps should be completed before any octane tests are run. Detailed procedures for each adjustment can be found in the manufacturers' shop manuals.

1. Record vehicle identification number and emission control type, Federal, Altitude, or California. Fill in heading on data sheet DFMF-11-1186. For knock sensor-equipped vehicles, two DFMF-11-1186 data sheets should be filled out completely: one for maximum requirement, and one for minimum requirement. Ford emission calibration numbers are to be recorded.

2. Inspect all vacuum lines and air pump hoses for appropriate connections. Also, check to see if PCV valve, spark advance vacuum delay controls, EGR valve, knock sensors, and heated inlet air mechanism are functioning. Engine must be warmed up for these checks.

3. Record engine idle speed and observe anti-dieseling solenoid operation. Adjust to manufacturers' recommended specifications as specified on the under-hood decal.

4. Observe and record basic spark timing at recommended engine speed. Adjust to manufacturers' recommended setting as specified on the under-hood decal.

5. Crankcase oil, radiator coolant, automatic transmission fluid, and battery fluid levels shall be maintained as recommended by the manufacturer.

6. A calibrated tachometer graduated in 100 rpm (or smaller) increments and capable of indicating engine speed from 0-5000 rpm shall be installed on each vehicle.

7. One calibrated vacuum gage, graduated in one-half inch of mercury (or smaller) increments and capable of indicating vacuum from 0-24 inches of mercury (0-81 kPa) shall be connected to the intake manifold. For vehicles with turbochargers, a compound vacuum/pressure gage should be used; the pressure side of the gage should be capable of indicating pressures up to 15 psi (103 kPa).

8. An auxiliary fuel system shall be provided to supply test fuels to the engine. Caution shall be taken to avoid placing auxiliary fuel lines in locations which promote vapor lock. If vehicles with carbureted engines have tank return fuel lines, this return line should be blocked off. Disconnect fuel tank vent line at evaporation control system canister. Instructions for fuel handling with fuel injection systems are given in Annex A.

9. For vehicles with owner questionnaire completed, a sample of the tank gasoline shall be withdrawn for determination of Research and Motor method octane number ratings. If insufficient fuel is available, omit this step and obtain tank fuel observations as described in Item D.3.d.(2).

D. TEST PROCEDURE

1. Engine Warm-Up

a. To stabilize engine temperatures, a minimum of ten miles of warm-up is required. The test vehicle should be operated at 55 mph (88 kph) in top gear with a minimum of full-throttle operation.

b. During the warm-up period, the general mechanical condition of the vehicle should be checked to insure satisfactory and safe operation during test work.

2. Fuel Changeover

Caution: Because of the installation of catalytic devices on these vehicles, permanent damage may result if the engine runs lean or stalls. Therefore, changeover from one fuel to another must be accomplished without running the carburetor or fuel injection system dry. Fuel handling procedures for vehicles equipped with fuel injection systems are explained in Annex A.

To eliminate contamination of the new fuel with residual amounts of the previous fuel, flush system twice with new fuel.

After fuel changeover, make one maximum-throttle acceleration before beginning Vehicle Rating Procedure.

3. Details of Observations

a. Operating Conditions

All octane number requirements will be determined under level road acceleration conditions.

Tests will be conducted on moderately dry days, preferably at ambient temperatures between 60°F (15.5°C) and 90°F (32.2°C). Tests should not be conducted during periods of high humidity such as prevail when rain is threatening or during or immediately after a rain storm. Laboratories with control capabilities should target for 70°F (21°C) air temperature and 50 grains of water per pound (7.14 gm/kg) of dry air whenever possible.

Air-conditioned vehicles will be tested with air conditioner turned ON. (Normal setting, minimum temperature, low fan.) Air conditioner will be ON at all times.

b. <u>Order of Fuel Testing</u>

1) Tank	3) FBRU
2) FBRSU	4) Primary

c. <u>Determination of Knock Intensity</u>

Maximum octane requirements will be established by evaluating the occurrence of knock in terms of knock intensity: "N" for none, "B" for borderline, and "A" for above borderline. Establishment of representative knock intensity for a given fuel will be accomplished with a maximum of three (3) rated accelerations. Coastdown time between the end of one acceleration and the beginning of the next should be approximately twenty (20) seconds. As defined below, the first two duplicating accelerations are sufficient with "N" and "B" intensity.

Acceleration Number 1	2	3	Representative Rating
N	N	-	N
N	B	N	N
N	B	B	B
B	N	B	B
B	B	-	B
B	A	-	A
A	-	-	A

All subsequent accelerations will normally be discontinued when "A" knock intensity is experienced, and testing continued with a higher octane number fuel in that series. <u>An exception will be made if "A" knock is experienced on the highest octane fuel which knocks in the engine</u>. In this case, it may be necessary to run additional accelerations to determine the speed of maximum knock intensity. If "A" knock is experienced at initiation of acceleration, as limited by transmission characteristics, this speed will be considered the speed of maximum knock. Otherwise, the midpoint between knock-in and knock-out will be considered the speed of maximum knock. When establishing knock-in and knock-out, back off on the throttle between points to eliminate "A" knock.

Minimum octane number requirements for vehicles equipped with knock sensors will be established in a similar manner except that when "A" knock intensity is encountered, subsequent accelerations will be made with a given fuel until duplicate "A" ratings are obtained over a measurable range of engine speeds as indicated below:

Acceleration Number			Representative Rating
1	2	3	
B	A	B	B
B	A	A	A
A	A	-	A
A	B	B	B

d. Determination of Octane Requirements

Tests should be run to 60 mph (97 kph) unless required to terminate at 55 mph (88 kph) because of legal speed limits.

(1) Vehicle Operating Procedure

(a) Establishment of Automatic Transmission Characteristics (for Maximum-Throttle Accelerations)

Obtain the transmission downshift characteristics of engine rpm and manifold vacuum/pressure at 25, 35, 45, and 55 mph (40, 56, 72, and 88 kph) incremental speeds (as obtainable in each gear), by movement of the throttle through the detent, i.e., downshift, throttle position. Also determine the minimum attainable road speed. These characteristics are to be determined for each of the gears specified in the table below. For transmissions with converter clutches, determine the minimum road speed for clutch application. At this initial speed and at 10 mph (16 kph), increments up to about 60 mph (97 kph) determine minimum vacuums (pressures) for application. Record all road speed/engine rpm/vacuum or pressure measurements from above on data sheet.

Do not use brakes, turn signals or hazard flashers during accelerations as these may affect electronic engine controls.

The selection of required test gears, and test gear/converter clutch combinations (if applicable) for various types of transmissions are shown in Table 7-I. Transmissions not explicitly described should be tested in a manner as similar as possible to those listed. Automatic transmission vehicles should be tested with the gear selector in D or O.

TABLE T-I

TRANSMISSION GEAR SELECTION

AUTOMATICS

Place the selector in "D" or "O" and check for critical condition.

Type	Gears to be Tested
GM 4-speed	4th gear, converter clutch engaged 3rd gear, converter clutch disengaged 2nd gear, converter clutch disengaged
GM 3-speed	3rd gear, converter clutch engaged 3rd gear, converter clutch disengaged 2nd gear, converter clutch disengaged
Ford 4-speed overdrive	4th gear 3rd gear 2nd gear
Other 3-speed	3rd gear 2nd gear

MANUALS

5-speed	4th and 3rd gears
4-speed	4th and 3rd gears
3-speed	3rd and 2nd gears

(b) Maximum-Throttle Accelerations - Automatic Transmissions

For maximum-throttle accelerations in each of the gears and gear/converter clutch combinations specified above, accelerate at the detent/application condition according to the speed versus vacuum/pressure profiles determined in (a) from the minimum obtainable speed up to 60 mph (97 kph). If the transmission downshifts, abort and start the acceleration again. Start with the highest gear or gear/clutch combination and proceed in descending order.

(c) Maximum-Throttle Accelerations - Manual Transmissions

Select the highest gear as specified in the table above. Start at the lowest speed from which the vehicle will accelerate smoothly or 30 mph (48 kph), whichever is higher, and depress the throttle full throughout the acceleration up to 60 mph (97 kph).

Select the next lower gear specified in the table above and accelerate at full throttle from the minimum speed from which the vehicle will accelerate smoothly up to 60 mph (97 kph).

(d) Part-Throttle Accelerations (Both Automatic and Manual Transmissions)

Select the highest gear as specified in Table T-I. For those with converter clutches use the highest gear up to the minimum vehicle speed at which the converter clutch will engage, and the highest gear/converter clutch combination above this minimum speed, to obtain the critical part-throttle vacuum or pressure. To obtain the critical part-throttle vacuum/pressure, first operate at constant speed road load, at 25, 35, 45, and 55 mph (40, 56, 72, and 88 kph) incremental speeds if obtainable in the specified gear. At each speed, move the throttle in 3 to 5 seconds from the road-load vacuum to the positions described below for naturally aspirated and turbocharged engines:

1. for naturally aspirated vehicles, one inch Hg (3.4 kPa) above:

   a. full-throttle vacuum for manual transmissions;

   b. detent vacuum for automatic transmissions without converter clutches.

   c. the minimum vacuum at which the converter clutch disengages for so-equipped automatic transmissions.

2. for turbocharged vehicles, one psi below:

   a. full-throttle maximum boost for manual transmissions;

   b. maximum boost at detent for automatic transmissions without converter clutches;

   c. maximum boost or one inch Hg (3.4 kPa) above the minimum vacuum at which the converter clutch disengages for so-equipped automatic transmissions.

The vehicle brakes may be applied lightly, if necessary, to maintain vehicle speed during throttle fanning, except for vehicles with converter clutch transmissions or EGR cut-outs.

If knocking occurs within any of the vacuum/pressure ranges, establish the manifold vacuum/pressure which gives maximum knock intensity on each fuel series. This is the critical vacuum/pressure to be used for all subsequent constant-vacuum/pressure part-throttle accelerations from the minimum obtainable speed in the test gear to 60 mph (97 kph), or until the vehicle ceases to accelerate. This critical vacuum/pressure should be determined for each reference fuel series.

(2) Tank Fuel Observations on Vehicles with Owner's Questionnaire

Investigate for maximum-throttle and part-throttle knock as detailed in Item 3d(1). Define maximum knock intensity as per Item 3c. Record maximum knock intensity, speed of maximum knock intensity, and manifold vacuum/pressure at each operating condition.

(3) Vehicle Rating Procedure

Knock rating should be performed while in a normal upright seated position with floor mats in place.

Step 1 - After Tank Fuel Observations, use a fuel estimated to give borderline knock in a given fuel series and investigate for incidence of knock under conditions as described in D.3.d.(1)(b) above, and D.3.d.(1)(c) above, whichever is applicable.

Step 2 - If no knock occurs, go to a lower octane number blend in that series and repeat Step 1.

Step 3 - If knock occurs at one or more of the operating conditions in Step 1, continue investigation at the critical condition(s) with higher octane blends until highest octane fuel giving knock is determined within one octane number or one blend (the next higher fuel gives no knock). Record maximum knock intensity on all fuels. Record speed of maximum knock intensity and manifold vacuum (pressure) on highest octane fuel that knocks.

Step 4 - Using the lowest octane blend that did not knock in Step 3, investigate for incidence of part-throttle knock as described in D.3.d.(1)(d). If knock occurs, continue investigation at critical vacuum/pressure until requirement is defined. Record maximum knock intensity and critical manifold vacuum/pressure on all fuels, and speed of maximum knock intensity on highest octane fuel that knocks.

Step 5 - With FBRU fuel only, if no knock occurs in Step 4, go to a lower octane number blend and repeat Step 4. Discontinue part-throttle investigation if knock is not observed with a fuel four octane numbers lower than determined in Step 3.

Step 6 - For knock sensor-equipped vehicles after determination of maximum requirement, continue with lower octane blends until the lowest octane fuel giving borderline knock is determined (the next lowest fuel giving above borderline knock).

The rating procedure is given in arrow diagram form on page D-30 for maximum requirement, and on page D-31 for minimum requirement, for knock sensor-equipped cars.

E. INTERPRETATION OF DATA

The data will be recorded on data sheet DFMF-11-1186. For knock sensor-equipped vehicles, two DFMF-11-1186 data forms should be filled out com-*pletely: one for maximum* requirement, and one for minimum requirement. Octane requirements for all reference fuels shall be determined as follows:

1. If the knock intensity of the highest reference fuel giving knock is borderline, the requirement shall be reported as the octane number of that fuel.

2. If the knock intensity of the highest fuel giving knock is above borderline, the requirement shall be reported as the mid-point between the octane number of the fuel giving knock and that of the next higher fuel.

3. If the octane requirement in high gear is equal to the requirement in a lower gear, report the highest gear data.

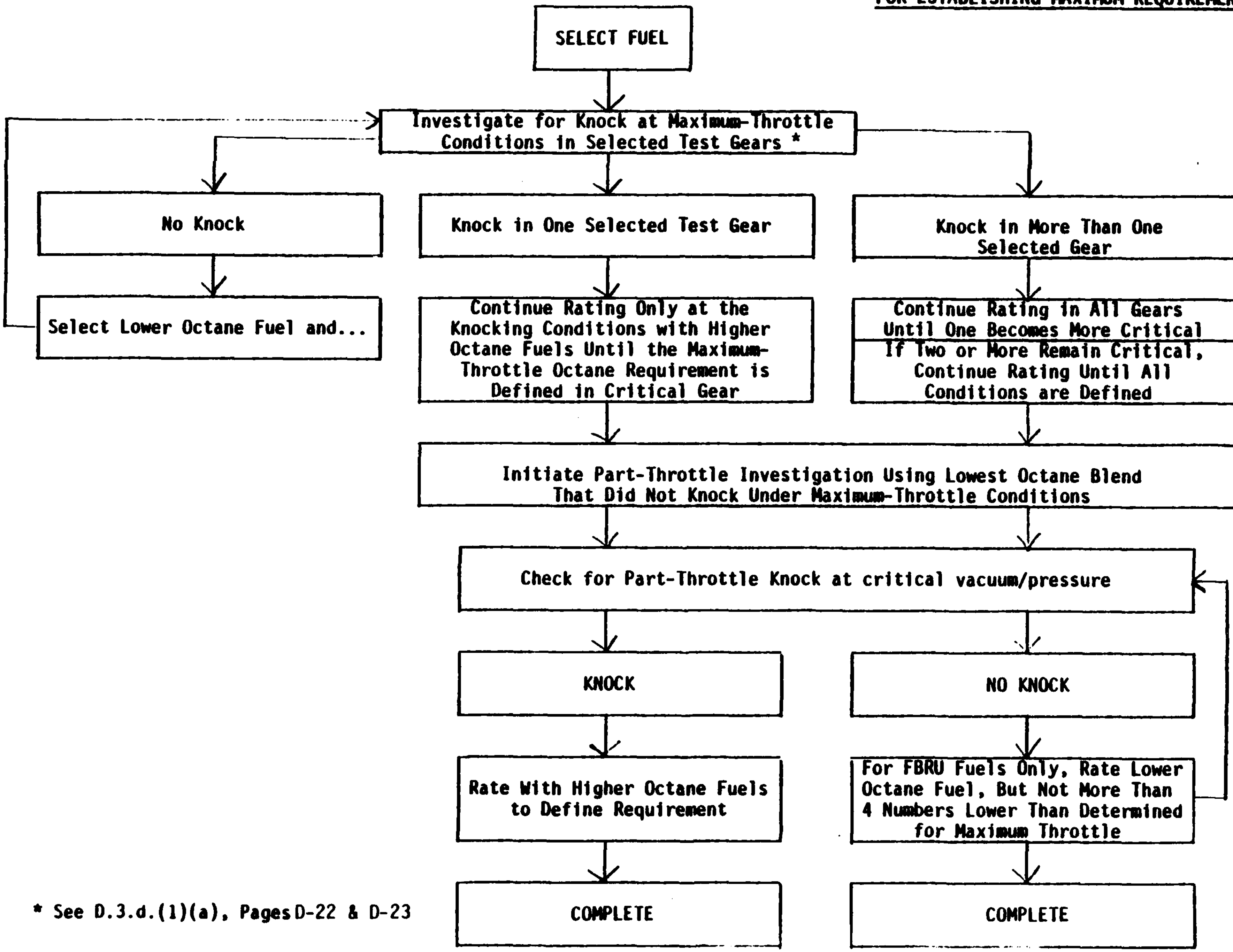
4. For part-throttle requirements, report the data from the critical manifold vacuum/pressure observations.

5. For knock sensor-equipped vehicles, report the highest and lowest fuel giving borderline knock.

Record data on all fuels tested, even though knock was not encountered. When transferring data to the summary block, record maximum-throttle and part-throttle octane number requirements in the appropriate blocks. The higher of the two will be selected by the computer as the maximum octane number requirement. If both maximum-throttle and part-throttle requirements are equal, then the computer will select the part-throttle requirmentas the maximum octane number requirement. Use proper letter designation (see footnotes on data sheet) to designate requirements outside of the reference fuel limits or FBRU part-throttle requirement more than four numbers below maximum.

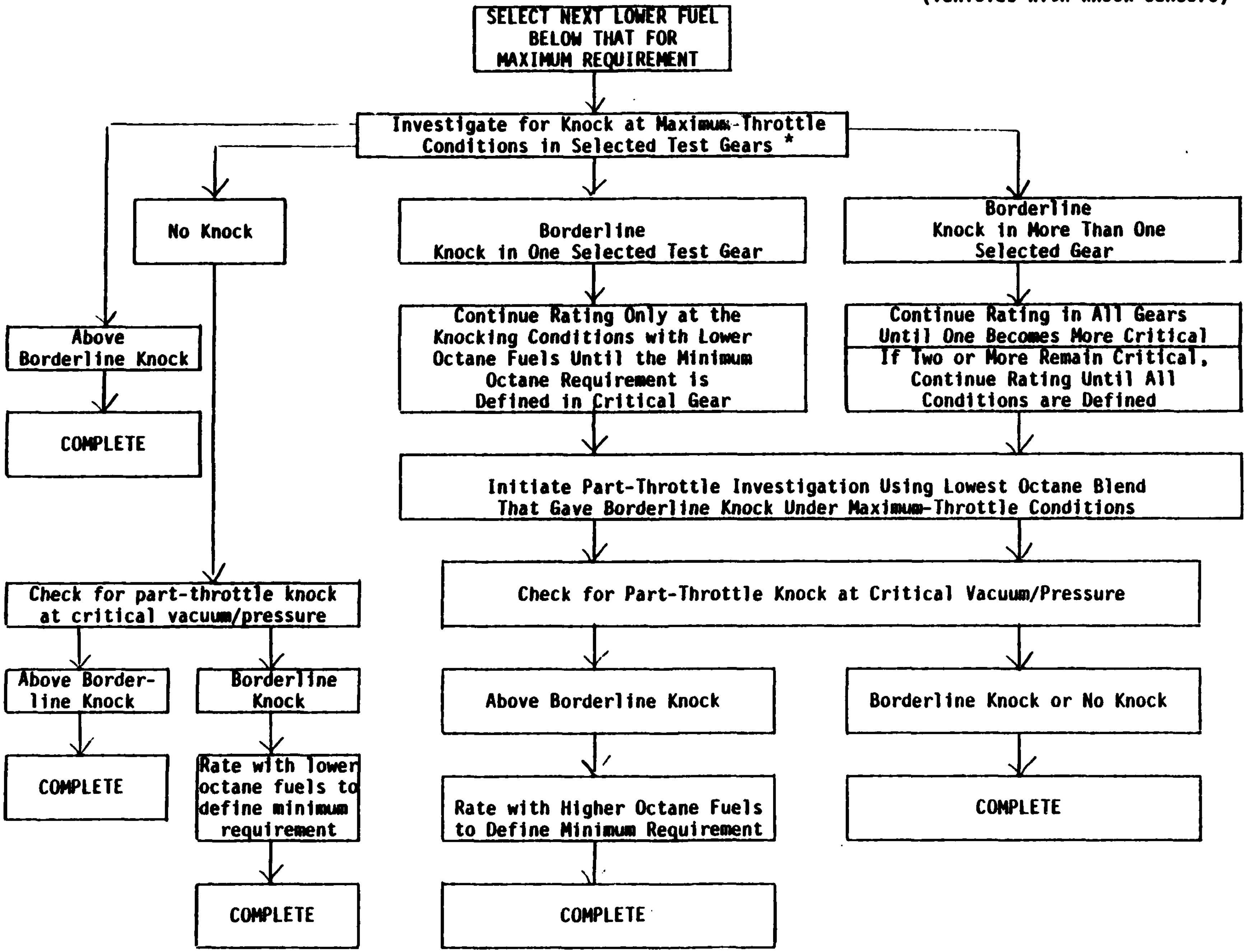
It is important that the vehicle identification number (VIN) of each vehicle tested be recorded on all data sheets to provide a means of cross-indexing.

FOR ESTABLISHING MAXIMUM REQUIREMENTS



* See D.3.d.(1)(a), Pages D-22 & D-23

FOR ESTABLISHING MINIMUM REQUIREMENTS
(Vehicles with knock sensors)



* See D.3.d.(1)(a), Pages D-22 & D-23

ANNEX A

to the

CRC E-15-86 TECHNIQUE

<u>PROCEDURE FOR SETTING UP VEHICLES</u>

<u>WITH FUEL INJECTION</u>

ANNEX A

TO THE CRC E-15-86 TECHNIQUE

PROCEDURE FOR SETTING UP VEHICLES AND HANDLING REFERENCE FUELS -- VEHICLES EQUIPPED WITH MULTIPLE-PORT FUEL INJECTION

1. To run octane requirements on fuel-injected vehicles it is necessary to run an external fuel line to the inlet of the vehicle fuel injection pump.

2. The fuel return line from the engine to the fuel tank must be disconnected after the fuel pressure regulator (in engine compartment) and before the fuel tank. An auxiliary line long enough to reach the cans must be added to the fuel return line.

3. Make certain that the fuel tank connections are plugged; this means both the normal fuel pump inlet line and the normal fuel return line connection. On vehicles with an in-tank booster pump, this pump must be shut off so it cannot run during the time the vehicle is operating on the external fuel system. If this pump is not disconnected, it will be destroyed.

4. An electric fuel pump (Bendix type acceptable) must be used to draw fuel from the reference fuel can to supply the fuel injection pump on the vehicle. Caution must be exercised to keep the fuel line between the reference fuel cans and the vehicle fuel injection pump full of fuel. If very much air gets into this line, the fuel injection system will become air bound and it is difficult to get the air out of the system.

5. Once the fuel injection pump line and return line have been disconnected, all subsequent operations must be done from an external fuel source.

6. It is possible to use three-way valves in the fuel line between the fuel pump and the fuel tank and between the return line and the fuel tank. When used, the operator must change the return line valve to the auxiliary fuel system while the engine is shut down, to avoid building up excessive pressure in the return line which could damage both the fuel pressure regulator and injection pump.

7. When changing from one reference fuel to another, the following steps must be followed:

    a. Put fuel inlet line in reference fuel tank with the return line going to a slop fuel can. Do not keep fuel inlet line out of the fuel can any longer than is necessary to move it from one can to the next. <u>DO NOT RUN OUT OF FUEL</u>.

b. Observe the fuel stream in the fuel return line. As soon as a steady flow of fuel is observed, move the fuel return line to an empty one-quart can (0.946 L). Allow one quart (0.946 L) of fuel to flow into this can before inserting the return line into the chosen reference fuel can. This operation should take about 60 seconds.

c. When going to the next reference fuel, it will be necessary to repeat Steps a and b.

The fuel injection pumps on most vehicles pump between 30 and 50 gallons (114-189 L/h) of fuel per hour. Therefore, Steps a and b should be folowed very closely or there will be gross reference fuel contamination, or you will use a lot more reference fuel than is required to run each test. If Steps a and b are followed exactly, you will be discarding to slop about two quarts (1.892 L) of reference fuel each time you change reference fuels. The two quarts (1.892 L) to slop will be at least as much fuel as is consumed to obtain the reference fuel rating.

CAUTION

For high-pressure fuel systems, be sure to relieve the pressure before disconnecting fuel lines. Also, use auxiliary fuel lines designed for high pressure. The engine and auxiliary fuel pump should be shut off while changing from auxiliary to tank fuels.

Diagnostic scanners should not be used while knock testing.

Auxiliary hoses should be rated for at least 250 psi working pressure and 1000 psi burst pressure.

PROCEDURE FOR SETTING UP VEHICLES AND HANDLING REFERENCE FUELS -- VEHICLES EQUIPPED WITH THROTTLE-BODY FUEL INJECTION

The General Motors throttle-body fuel injection system is shown in the attached schematic drawing. The fuel supply system consists of an in-tank electric fuel pump, a full-flow fuel filter mounted on the vehicle frame, a fuel pressure regulator integral with the throttle body, fuel supply and return lines, and two fuel injectors. The injection timing and amount of fuel supplied is controlled by an electronic control module (not shown in figure). To prepare a vehicle with this system for octane requirement testing, an auxiliary electric fuel pump must be installed. The fuel pressure regulator controls fuel pressure at the injectors to a nominal 10.5 psi; therefore, an auxiliary pump capable of at least 10.5 psi outlet pressure must be used for satisfactory engine operation. The following procedure is recommended for preparing a vehicle with throttle-body fuel injection for octane requirement testing and for changing reference fuels during such testing:

1. Disconnect and plug the fuel supply and fuel return lines at the locations shown in the figure. Install an additional line between the fuel supply line and the outlet of the auxiliary pump. Connect the inlet of the auxiliary pump to the reference fuel can. Connect the fuel return line to the reference fuel can through a tee at the auxiliary pump inlet. All auxiliary fuel lines are indicated by dashed lines in the figure.

2. An optional arrangement would be to use three-way selector valves in the fuel supply and fuel return lines at the locations where auxiliary fuel lines are connected. When these valves are used, the operator must change the valves to the external fuel system while the engine is shut off to avoid building up excessive pressure in the fuel return line.

3. Disconnect the in-tank fuel pump so it cannot run during the time the vehicle is operating on the external fuel system. If this pump is not disconnected, it may be destroyed.

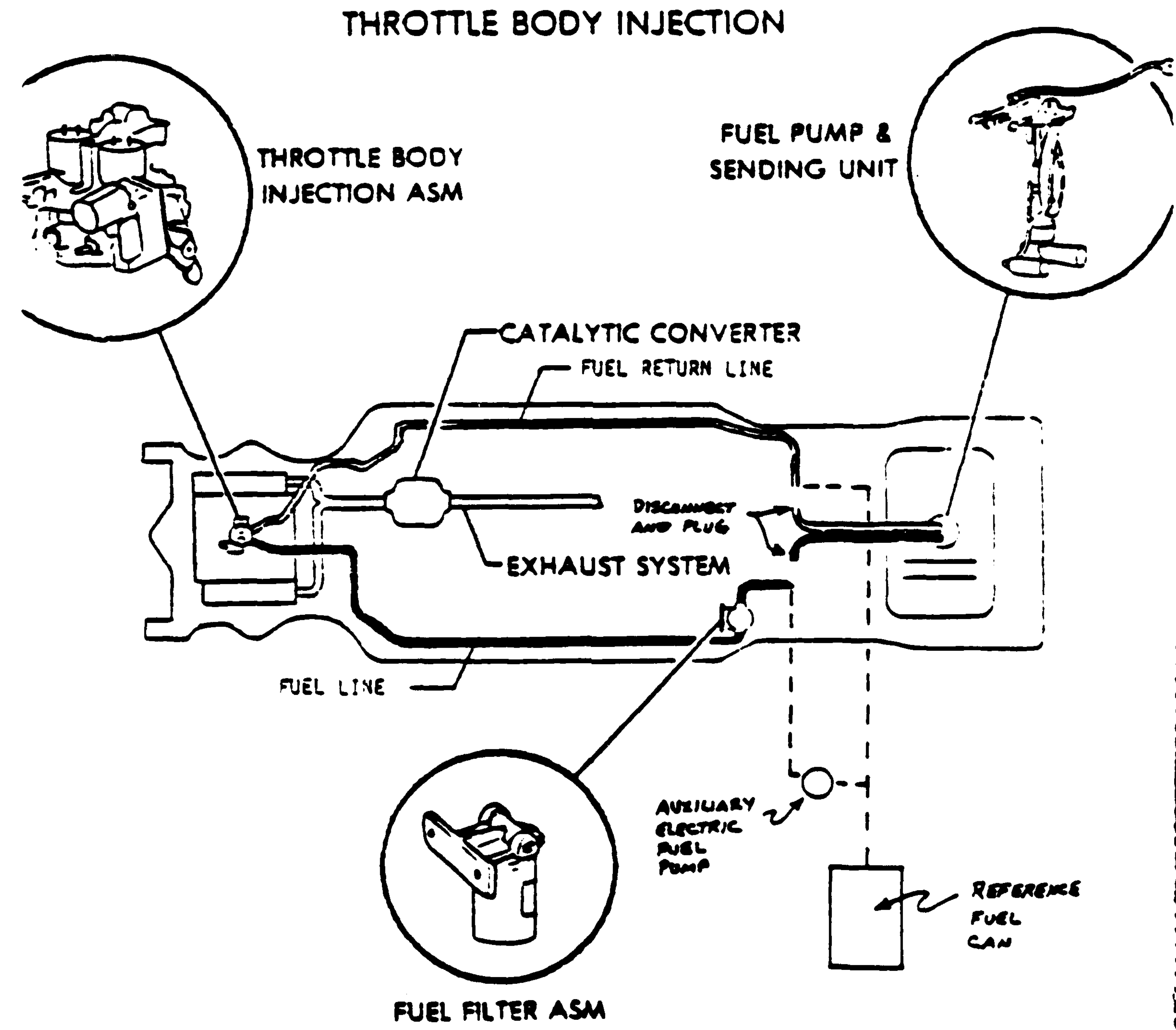
4. When changing from one reference fuel to another, the following steps should be followed:

    a. Disconnect fuel inlet line from reference fuel can and run engine a short time; do not run out of fuel since this will introduce air into the fuel injection system, and excessive cranking will be required to restart the engine.

    b. Insert fuel inlet line in desired reference fuel can; operate vehicle for two miles at a maximum speed of 55 mph during which time four part-throttle accelerations are made. This must be done to ensure that the vehicle fuel system has been purged and contains the desired reference fuel for octane rating.

    c. When changing to another reference fuel, repeat Steps a and b.

PROCEDURE FOR SETTING UP VEHICLES AND HANDLING REFERENCE FUELS
-- VEHICLES EQUIPPED WITH THROTTLE-BODY FUEL INJECTION - (Continued)



PROCEDURE FOR SETTING UP VEHICLES AND HANDLING REFERENCE FUELS -- FORD VEHICLES EQUIPPED WITH CENTRAL FUEL INJECTION SYSTEM

A vehicle schematic of one of Ford's central fuel injection systems is shown on the following drawing (other systems vary in configuration dependent upon engine/model type - see note 1). This fuel system consists of: an electric in-tank fuel pump, primary and secondary full-flow fuel filters, throttle-body assembly with integral fuel pressure regulator and two fuel injectors, fuel supply and return lines. The following procedure is recommended for preparing the vehicle for octane requirement testing:

1. Relieve pressure in fuel system using valve provided on throttle body. Fuel supply lines will remain pressurized for long periods of time after engine shut down. Disconnect and cap the fuel supply and fuel return lines leading from the fuel tank. Access to connection points may be obtained through either the: rear wheel wells, underbody, or engine compartment, dependent upon vehicle type. Install additional lines to the open supply and return lines and lead these lines back into the vehicle.

2. Connect the added fuel supply line to an auxiliary fuel pump. The fuel pressure regulator in the throttle body controls fuel pressure to a nominal 39.9 psi; therefore, it requires an auxiliary fuel pump capable of providing at least 45 psi outlet pressure (see note 1). The added 5.1 psi is needed to sufficiently overcome the pressure head and line restriction losses. Connect a supply line to the auxiliary pump from the reference fuel can. A fuel filter may be required between the auxiliary pump and reference fuel can to protect the pump. Also, connect the added fuel return line to the fuel reference can and vent the reference can to outside the vehicle.

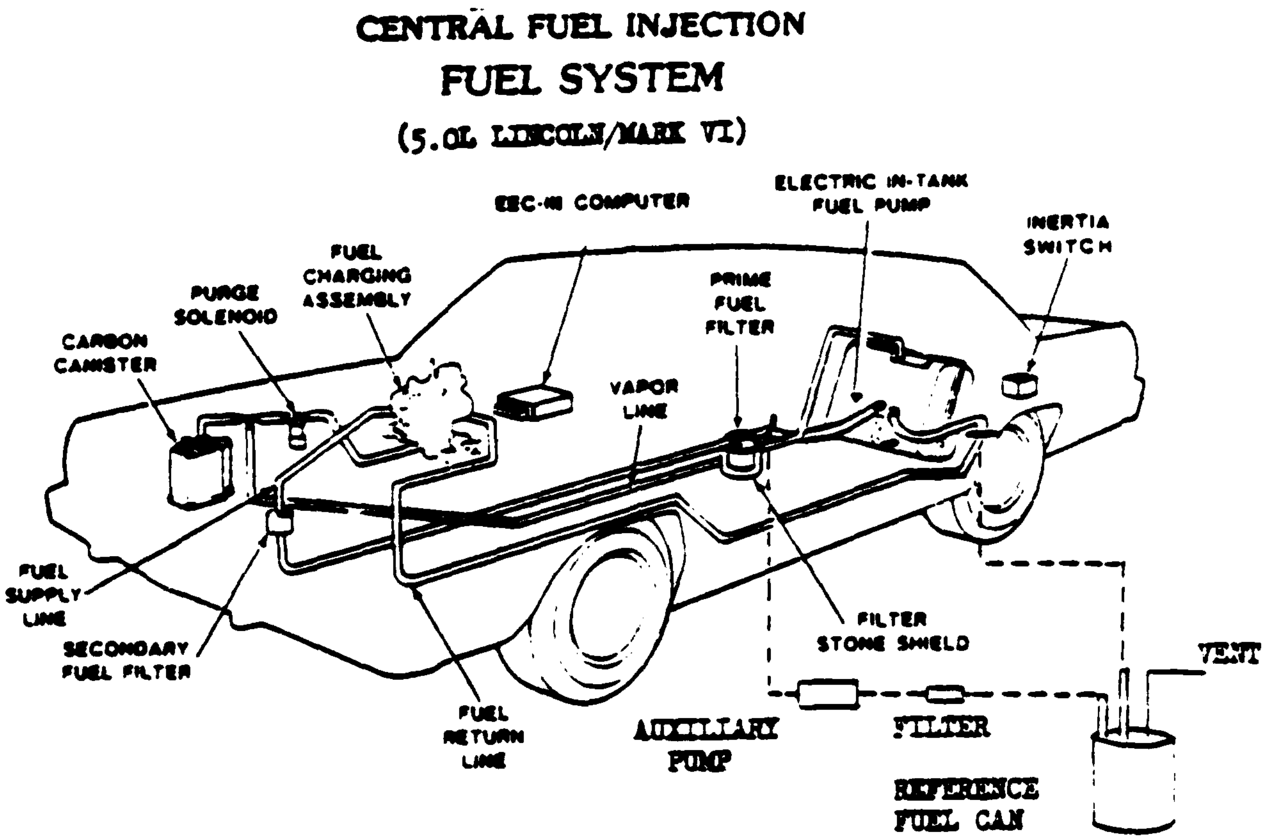
3. Disconnect the electrical supply to the electric in-tank fuel pump, either by disconnecting the plug on the fuel tank or by disarming the inertia switch located in the trunk. Failure to disarm the in-tank fuel pump may result in a damaged pump. The voltage supplied to the inertia switch may be used as an electrical source for the auxiliary fuel pump. This voltage source is controlled by the on-board computer allowing the auxiliary pump to respond the same as would the in-tank fuel pump. When making this connection, do not "splice" into the wire, instead connect the wire lead to the connector.

4. When changing from one reference fuel to another, the following steps should be followed, or else reference fuels may become contaminated:

   a. With the engine shut off, disconnect the fuel return line from the reference fuel can and connect it to an extra empty can. Connect the fuel pump supply line to the new reference fuel can and run the engine for approximately 30 seconds, purging the old reference fuel into the extra can (timing is dependent upon length of added fuel lines). After the sytem is purged, shut the engine off and connect the fuel return line to the new reference fuel can forming a closed fuel loop. Now the vehicle is ready to be tested on the desired reference fuel.

   b. When changing to another reference fuel, repeat Step a.

PROCEDURE FOR SETTING UP VEHICLES AND HANDLING REFERENCE FUELS
-- FORD VEHICLES EQUIPPED WITH CENTRAL FUEL INJECTION SYSTEM - (Continued)



1/ **NOTE:**

Some vehicles have both a low pressure in-tank fuel pump and a high pressure under body fuel pump. The on-board high pressure pump may be used if supplied with an auxiliary pump. In all cases, it is required that on-board pumps not used, be disarmed. The inertia switch located in the rear of the vehicle will disarm both pumps. Fuel lines on some vehicles may be accessed only in the engine compartment, or by dropping the fuel tank.

APPENDIX E

1986 OCTANE NUMBER REQUIREMENT SURVEY DATA

GLOSSARY

(For Appendix E Only)

Emission Certification (EMCT):	A	Altitude
	C	California
	F	Federal
	B	Both California and Altitude
Knock Sensor (KNK SEN):	Y	Yes
	N	No
Air Conditioner:	Y	Yes
	N	No
Spark Advance:	+	Before Top Center
	-	After Top Center
Test Fuel:	1	Tank Fuel
	2	FBRSU
	3	FBRU
	4	PR
Octane Number Requirements: (expressed as Research ON)	L	Less than lowest available ON for FBRU and FBRSU fuels and less than 76 for PR fuels
	H	Higher than highest available ON for FBRU and FBRSU fuels and higher than 100 ON for PR fuels
	F	Part-throttle requirement greater than four numbers below maximum-throttle requirement
Throttle (THR):	M	Maximum
	P	Part
Gear:	1-5	Manual and Automatic
Torque Converter (CONV):	N	Not tested in lockup
	Y	Tested in lockup
Manifold Vacuum (MV):		Inches Hg, positive (+) for vacuum, negative (-) for pressure
Owner-Reported Knock (OWKNK):	Y	Yes, Not Objectionable
	O	Objectionable
	N	No
Rater-Reported Noise Intensity (NINT):	N	None
	B	Borderline
	A	Above Borderline

1986 CRC OCTANE NUMBER REQUIREMENT SURVEY

VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																									
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWKNK	OCT NO RES	OCT NO MOT	NINT	THR	GEAR	RPM	MV
29-16	DCD T22A3	F	N	9.5	Y	+12	+12	15671	70	30.10	60	3	90.5	M	3	N	1950	1.1	90.5	3	N	1850	4.0	Y			A	M	2	1900	0.9
												2	92.0	M	2	N	2000	0.9													
												4	89.5	M	2	N	2000	0.9													
07-20	DCD T22A3	F	N	9.5	Y	+12	+12	7222	72	30.37	48	3	89.0	M	3	N	2300	0.8	87.0	3	N	2950	5.5	Y			N				
												2	89.0	M	3	N	3000	0.8													
												4	89.0	M	2	N	2850	0.6													
26-01	DCD T22A3	F	N	9.5	Y	+12	+12	10521	89	29.94	134	3	87.0	M	3	N	1700	0.5	86.0	3	N	1750	1.5		93.5		N				
												2	87.0	M	3	N	1800	0.5													
												4	86.0	M	2	N	1800	0.5													
26-04	DCD T22A3	F	N	9.5	Y	+12	+12	10172	85	29.93	140	3	85.0	M	3	N	1900	0.5	85.0	3	N	1800	1.5		94.2		N				
												2	85.0	M	3	N	1850	0.5													
												4	83.0	M	3	N	1850	0.5													
47-01	DEE TP22A3	C	Y	H	8.1	Y	+12	+12	17025	70	30.13	50	3	92.0	M	3	N	2700	0.2	91.0	3	N	2700	-2.0								
												2	95.0	M	3	N	2700	0.2													
												4	92.5	M	3	N	2900	-4.0													
47-02	DEE TP22A3	C	Y L	8.1	Y	+12	+12	17025	70	30.13	50	3	91.0	M	3	N	2700	.2	90.0	3	N	2800	-4.0								
												2	94.0	M	3	N	2800	.2													
												4	92.0	M	3	N	2900	-4.0													
47-03	DEE TP22A3	C	Y H	8.1	Y	+12	+12	17506	70	30.12	50	3	95.0	M	3	N	2800	-2.0	95.0	3	N	2800	0.0								
												2	97.0	M	3	N	2900	-2.0													
												4	93.0	M	3	N	2850	-2.0													
47-04	DEE TP22A3	C	Y L	8.1	Y	+12	+12	17506	70	30.12	50	3	94.0	M	3	N	2750	-2.0	94.0	3	N	2850	0.0								
												2	96.0	M	3	N	2800	-2.0													
												4	92.0	M	3	N	3200														
08-25	DNE TP22A3	A	Y H	8.1	Y	+12	+12	12400	79	29.53	101	3	91.0	M	3	N	2400	-4.0	F								B	M	3	2350	-4.0
												2	94.0	M	3	N	2400	-4.0													
												4	89.0	M	3	N	2400	-4.0													
08-26	DNE TP22A3	A	Y L	8.1	Y	+12	+12	12400	79	29.53	101	3	86.0	M	3	N	2400	-4.0	F												
												2	88.0	M	3	N	2400	-4.0													
												4	84.0	M	2	N	2600	1.2													
29-14	DCE TP22A3	F	Y H	8.1	Y	+12	+12	12775	70	30.40	60	3	96.5	P	3	N	2850	-5.0						Y			A	M	2	2700	-8.0
												2	96.5	P	3	N	2900	-5.0													
												4	96.5	M	2	N	3300	-8.0													
05-32	DNE TP22A3	F	Y H	8.1	Y	+12	+12	14019	66	30.38	43	3	97.0	M	3	N	2800	-4.0	95.0	3	N	2400	-.5								
												2	99.0	M	3	N	2800	-4.0													
												4	94.0	M	3	N	2975	-4.0													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																									
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OK KNK	OCT NO RES	OCT NO MOT	INIT	THR	GEAR	RPM	MV
05-33	DHE TP22A3	F	Y L	8.1	Y	+12	+12	14019	66	30.38	43	3	96.0	M	3	N	2800	-4.0													
												2	97.0	M	3	N	2825	-4.0													
												4	93.0	M	3	N	2950	-4.0													
28-26	DCE TP22A3	F	Y H	8.1	Y	+12	+12	32466	70	29.26	48	3	94.0	M	3	N	2300	1.0	94.0	3	N	2100	3.5								
												2	95.5	M	3	N	2300	1.0													
												4	95.0	M	3	N	2450	1.0													
28-27	DCE TP22A3	F	Y L	8.1	Y	+12	+12	32466	70	29.26	48	3	94.0	M	3	N	2300	1.0	94.0	3	N	2100	3.5								
												2	95.5	M	3	N	2300	1.0													
												4	95.0	M	3	N	2300	1.0													
28-30	DCE TP22A3	F	Y H	8.1	Y	+12	+12	33943	70	29.26	50	3	96.0	M	3	N	1300	1.5	95.0	3	N	1400	4.0				N				
												2	97.0	M	3	N	1550	1.5													
												4	95.0	M	3	N	1450	1.5													
28-31	DCE TP22A3	F	Y L	8.1	Y	+12	+12	33943	70	29.26	50	3	93.0	M	3	N	1400	1.5	93.0	3	N	1450	4.0								
												2	94.0	M	3	N	1600	1.5													
												4	94.0	M	3	N	1400	1.5													
46-16	DHE TP22A3	F	Y H	8.1	Y	+12	+12	8420	72	29.30	58	3	82.0	M	3	N	2800	-5.0	82.0	3	N	2500	-4.0	N	91.2	83.8	N				
												2	81.0	M	3	N	2850	-6.0													
												4	80.0	M	3	N	2875	-5.0													
46-17	DHE TP22A3	F	Y L	8.1	Y	+12	+12	8420	72	29.30	58	3	81.0	M	3	N	2600	-5.0	81.0	3	N	2550	-4.0								
												2	81.0	M	3	N	2850	-5.0													
												4	80.0	M	3	N	2875	-5.0													
41-19	DMP 252A3	C	Y H	9.1	Y	+ 7	+ 7	6244	64	29.98	50	3	90.0	M	3	N	1700	1.6	88.0	3	N	1700	2.6		93.8	83.7	N				
												2	91.0	M	3	N	1700	1.6													
												4	89.0	M	3	N	1700	1.6													
52-06	ES 216M5	F	N	9.4	Y	+10	+10	8167	70	30.46	56	3	84.0	M	4	N	3250	1.6	F					N			N				
												2	88.0	M	3	N	3300	1.6													
												4	84.0	M	3	N	3200	1.6													
41-27	GCB T41A4	C	N	9.0	Y	+10	+10	12952	67	30.14	54	3	92.0	M	4	N	2100	1.2	F						94.2	83.9	N				
												2	93.0	M	4	N	2100	1.2													
												4	90.0	M	4	N	2100	1.2													
98-36	GCB T41A4	F	N	9.0	Y	+10	+10	12669	77	29.75	26	3	86.0	M	3	Y	1500	2.0	F								N				
												2	87.0	M	3	Y	1500	2.0													
												4	84.0	M	3	Y	1450	2.0													
23-24	GCB T41A4	F	N	9.0	Y	+10	+10	6341	58	28.99	33	3	90.0	M	4	Y	1400	1.0	89.0	4	Y	1400	2.0				N				
												2	91.0	M	2	N	3400	1.3													
												4	89.0	M	4	Y	1300	1.0													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	NINT	THR	GEAR	RPM	MV
65-14	GC8 T41A4	A	N	9.0	Y	+10	+10	11141	61	29.33	62	3	88.5	M	4	Y	1600	3.0	87.5	4	Y	1500	4.0				N				
												2	89.0	M	4	Y	1700	2.0													
												4	86.5	M	4	Y	1500	2.0													
26-05	GC8 T41A4	F	N	9.0	Y	+10	+10	25976	90	29.93	124	3	80.0	M	2	N	1850	0.5	L						92.7		N				
												2	80.0	M	2	N	1900	0.5													
												4	78.0	M	2	N	1900	0.5													
23-15	GK8 T41A4	F	N	9.0	Y	+10	+10	7894	78	29.28	60	3	87.0	M	4	Y	1400	1.0	87.0	4	Y	1400	2.0				N				
												2	87.0	M	4	Y	1400	1.0													
												4	85.0	M	4	Y	1400	1.0													
41-20	HAR T25A3	C	N	9.0	Y	+ 8	+ 8	20428	67	29.98	47	3	89.0	M	3	Y	2100	1.6	F						93.2	83.8	N				
												2	90.0	M	3	Y	2100	1.6													
												4	87.5	M	3	Y	2100	1.6													
29-11	HAR T25A3	F	N	9.0	Y	+ 8	+ 8	12419	70	30.10	60	3	94.0	M	2	N	2300	1.3	90.0	4	Y	1600	3.0	Y			A	M	2	2300	1.3
												2	94.0	M	2	N	2300	1.3													
												4	88.0	M	2	N	2300	1.3													
23-04	HAR T25A3	B	N	9.0	Y	+10	+ 8	7499	58	29.34	24	3	90.0	M	4	Y	1800	1.5	F								N				
												2	91.0	M	4	Y	1800	1.5													
												4	89.0	M	4	Y	1800	1.5													
40-03	HAR T25A3	F	N	9.0	Y	+ 8	+ 8	11800	51	30.14	32	3	99.5	M	3	Y	1800	3.0	F						92.0	84.0	A	P	3	2000	3.[illegible]
												2	100.5	M	3	Y	2050	2.5													
												4	96.0	M	3	Y	1800	3.0													
40-04	HAR T25A3	F	N	9.0	Y	+ 8	+ 8	11960	45	30.31	28	3	96.0	M	3	Y	1800	2.0	F						92.0	84.0	A	M	3	2200	2.0
												2	98.0	M	3	Y	1950	2.0													
												4	91.0	M	3	Y	2100	1.0													
65-06	HAR T25A3	F	N	9.0	Y	+ 8	+ 8	16114	78	29.24	102	3	99.0	M	3	Y	1800	2.0	F								A	M	3	1800	2.5
												2	101.0	M	3	Y	1800	2.0													
												4	98.0	M	3	Y	1700	2.0													
46-03	HAR T25A3	F	N	9.0	Y	+ 8	+ 8	12276	74	29.20	82	3	85.0	M	3	Y	1975	2.0	F					N	90.7	83.2	N				
												2	87.0	M	3	Y	2025	2.0													
												4	84.0	M	3	Y	1950	2.0													
65-33	HAN P28A3	F	N	8.5	Y	+10	+10	18233	49	29.33	31	3	87.5	M	3	Y	1700	1.5	87.5	3	Y	1800	2.5				N				
												2	87.5	M	3	Y	1700	1.5													
												4	85.5	M	3	Y	1700	1.5													
65-32	HAN P28A4	F	N	8.5	Y	+10	+10	15768	58	29.42	30	3	96.5	M	2	N	3900	0.0	F					N	96.9	86.1	N				
												2	95.5	M	2	N	3600	0.0													
												4	91.0	M	2	N	3900	0.0													

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OBS NO	MODEL CODE	VEHICLE DESCRIPTION: ENCT	KNK SEN	C.R.	AIR	SPARK ADVANCE: AS RCD	SPARK ADVANCE: AS TST	ODOM MILES	WEATHER: AMB TMP	BAROM	HUM	FUEL	MAXIMUM: OCT NO	THR	GEAR	CONV	RPM	MV	PART THROTTLE: OCT NO	GEAR	CONV	RPM	MV	TANK FUEL INFORMATION: ONKNK	OCT NO: RES	OCT NO: MOT	RATER: NINT	THR	GEAR	RPM	MV
29-07	HAX 228A4	F	N	8.5	Y	+10	+10	18319	70	30.10	62	3	91.5	P	4	Y	1300	5.0						N			N				
												2	94.0	P	4	Y	1300	5.0													
												4	89.0	P	4	Y	1350	5.0													
23-28	HBN 450A4	F	Y H	9.5	Y	0	0	10701	60	30.03	45	3	93.0	M	4	Y	900	1.0	89.0	4	Y	900	2.0				8	M	4	900	1.0
												2	93.0	M	4	Y	900	1.0													
												4	91.0	M	4	Y	900	1.0													
23-29	HBN 450A4	F	Y L	9.5	Y	0	0	10701	60	30.03	45	3	89.0	M	4	Y	900	1.0													
												2	90.0	M	4	Y	900	1.0													
												4	88.0	M	4	Y	900	1.0													
23-05	HGA 238A3	F	Y H	8.0	Y	+14	+15	7457	58	29.25	26	3	87.0	M	3	N	1800	1.0	86.0	3	Y	1800	2.0				N				
												2	89.0	M	3	N	1700	1.0													
												4	87.0	M	3	N	1800	1.0													
23-06	HGA 238A3	F	Y L	8.0	Y	+14	+15	7457	58	29.25	26	3	84.0	M	3	N	1800	1.0													
												2	84.0	M	3	N	1700	1.0													
												4	82.0	M	3	N	1700	1.0													
46-01	HGA 238A3	F	Y H	8.0	Y	+15	+15	8209	78	29.16	80	3	L						L					N	92.0	82.3	N				
												2	L																		
												4	L																		
46-02	HGA 238A3	F	Y L	8.0	Y	+15	+15	8209	78	29.16	80	3	L						L												
												2	L																		
												4	L																		
05-04	HGH 450A4	F	Y H	9.5	Y	0	0	7544	69	30.18	50	3	93.0	M	4	Y	1025	1.6	F								8	M	4	1030	1.6
												2	95.0	M	4	Y	1100	1.4													
												4	90.0	M	2	N	1200	1.0													
05-05	HGH 450A4	F	Y L	9.5	Y	0	0	7544	69	30.18	50	3	92.0	M	4	Y	1050	1.4	F												
												2	94.0	M	4	Y	1125	1.4													
												4	90.0	M	2	N	1200	1.0													
08-18	HJO T18A3	F	N	8.8	Y	+ 8	+ 8	7798	75	29.90	87	3	88.0	M	3	Y	1550	2.0	F								N				
												2	89.0	M	3	Y	1550	2.0													
												4	86.0	M	3	Y	1475	2.0													
41-03	HNU T25A3	C	N	9.0	Y	+ 8	+ 8	12532	68	30.03	49	3	90.0	M	2	N	3200	1.2	F						92.6	82.9	8	M	2	3200	1.2
												2	91.0	M	2	N	3200	1.2													
												4	89.0	M	2	N	3200	1.2													
06-06	HNU T25A3	F	N	9.0	Y	+ 8	+ 8	6251	68	30.05	83	3	90.0	M	3	Y	2000	1.8	F					N	93.5	82.4	N				
												2	91.0	M	3	Y	1900	1.8													
												4	84.0	M	3	Y	1900	1.8													

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OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	WEATHER AMB TMP	WEATHER BAROM	WEATHER HUM	FUEL	MAXIMUM OCT NO	MAXIMUM TECH	MAXIMUM GEAR	MAXIMUM CONV	MAXIMUM RPM	MAXIMUM MV	PART THROTTLE OCT NO	PART THROTTLE GEAR	PART THROTTLE CONV	PART THROTTLE RPM	PART THROTTLE MV	ONKNK	TANK FUEL OCT NO RES	TANK FUEL OCT NO MOT	RATER NINT	RATER TECH	RATER GEAR	RATER RPM	RATER MV
47-19	HNU T25A3	C	N	9.0	Y	+ 8	+ 8	20550	70	29.98	50	3	98.5	P	3	Y	1500	9.0	98.5	3	Y	1500	9.0								
												2	97.0	M	3	Y	1900	2.0													
												4	88.0	M	3	Y	1900	2.0													
26-09	HNU T25A3	F	N	9.0	Y	+ 8	+ 8	19121	83	29.89	140	3	91.0	M	3	Y	1500	2.0	90.0	3	Y	1400	3.0		92.1		B	M	3	1500	2.0
												2	93.0	M	3	Y	1400	2.5													
												4	82.0	M	3	Y	1400	2.5													
46-18	HNU T25M5	F	N	9.0	Y	+ 8	+ 8	8703	77	29.38	94	3	87.0	M	4	N	1950	1.0	84.5	4	N		2.0	N	91.7	83.4	N				
												2	87.0	M	4	N	2050	1.0													
												4	84.0	M	4	N	2050	1.0													
65-18	HP9 P29A3	F	N	8.5	Y	+10	+10	8764	58	29.90	39	3	88.0	M	2	N	3300	1.7	87.0	3	Y	2200	6.5				N				
												2	90.0	M	3	N	3150	2.0													
												4	87.0	M	3	Y	2500	2.0													
05-36	HPR T25M5	F	N	9.0	Y	+ 8	+ 8	6052	66	30.33	34	3	90.5	M	3	N	2050	1.5	89.0	4	N	1775	4.5	N	91.3	82.7	N				
												2	93.0	M	3	N	2200	1.5													
												4	87.0	M	4	N	2025	1.5													
08-12	IAR T25A3	F	N	9.0	Y	+ 8	+ 8	6246	73	29.82	75	3	88.0	M	3	Y	1800	1.5	94.0	3	Y	1400	6.0				N				
												2	89.0	M	3	Y	1800	1.5													
												4	84.0	M	3	Y	1800	1.5													
23-19	IAR T25A3	B	N	9.0	Y	+10	+ 8	7409	52	29.25	20	3	92.0	M	3	Y	1500	1.3	99.0	3	Y	1500	2.0				N				
												2	94.0	M	3	Y	1500	1.2													
												4	91.0	M	3	Y	1500	1.2													
65-07	IAR T25A3	F	N	9.0	Y	+ 8	+ 8	8020	77	29.36	64	3	95.5	M	3	Y	2000	2.5	F								B	M	3	2000	2.5
												2	96.5	M	3	Y	2000	2.5													
												4	90.0	M	3	Y	2000	2.5													
47-22	IAR T25A3	C	N	9.0	Y	+ 8	+ 8	7200	70	29.96	50	3	99.0	M	3	Y	1600	1.5	97.0	3	Y	1600	5.0								
												2	99.0	M	3	Y	1600	1.5													
												4	92.5	M	3	Y	1600	1.5													
26-12	IAR T25A3	F	N	9.0	Y	+ 8	+ 8	9600	72	30.01	50	3	95.0	P	3	Y	1350	4.0	95.0	3	Y	1350	4.0		92.2		A	M	3	1500	2.0
												2	97.0	P	3	Y	1350	5.0													
												4	88.0	M	3	Y	1350	2.0													
26-40	IAR T25A3	F	N	9.0	Y	+ 8	+ 8	7064	62	29.82	54	3	84.5	M	3	Y	1600	2.0	84.0	3	Y	1500	3.5		98.6		N				
												2	88.0	M	3	N	2200	1.0													
												4	82.0	M	3	Y	1400	2.0													
41-15	IAN P28A3	C	N	8.5	Y	+10	+10	6890	64	30.15	52	3	89.0	M	2	N	3500	0.8	F					N	93.0	82.9	N				
												2	89.0	M	2	N	3500	0.8													
												4	86.0	M	2	N	3500	0.8													

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OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	WEATHER AMB TMP	WEATHER BAROM	WEATHER HUM	FUEL	MAXIMUM OCT NO	MAXIMUM THR	MAXIMUM GEAR	MAXIMUM CONV	MAXIMUM RPM	MAXIMUM MV	PART THROTTLE OCT NO	PART THROTTLE GEAR	PART THROTTLE CONV	PART THROTTLE RPM	PART THROTTLE MV	ONKNK	TANK FUEL OCT NO RES	TANK FUEL OCT NO MOT	RATER INIT	RATER THR	RATER GEAR	RATER RPM	RATER MV
41-02	IAW P28A4	C	N	8.5	Y	+10	+10	7011	66	30.11	52	3	86.5	M	2	N	3750	0.8	F						92.8	83.8	N				
												2	88.0	M	2	N	3750	0.8													
												4	86.0	M	2	N	3750	0.8													
05-15	IAW P28A4	F	N	8.5	Y	+ 8	+ 8	9392	68	30.51	44	3	91.0	M	3	N	3250	1.0	F					N	96.0	85.0	N				
												2	93.0	M	3	N	3250	1.0													
												4	87.0	M	3	N	3300	1.0													
05-27	IAX 228A3	F	N	8.5	Y	+10	+10	9381	70	29.98	51	3	92.0	M	3	N	2300	3.0	F					N	94.2	35.7	A	M	3	2100	3.5
												2	94.0	M	3	N	2250	3.5													
												4	90.0	M	3	N	2250	3.5													
29-08	IAX 228A4	F	N	8.5	Y	+10	+10	20136	70	30.10	60	3	89.5	M	3	N	2300	1.5	98.0	4	Y	1350	4.0	N			N				
												2	92.0	M	3	N	2300	1.5													
												4	87.0	M	2	N	2200	1.4													
46-19	IAX 228A4	F	N	8.5	Y	+10	+10	6475	74	29.10	82	3	80.0	M	3	N	2600	1.5	79.0	4	Y	1600	2.5	N			N				
												2	83.0	M	3	N	2250	1.5													
												4	78.0	M	3	N	2800	1.5													
07-04	IAX 228A4	F	N	8.5	Y	+10	+10	7971	70	30.25	56	3	90.0	M	4	Y	1700	1.8	87.0	4	Y	1650	3.5	N	92.3	82.6	N				
												2	91.0	M	4	Y	1600	1.8													
												4	88.0	M	4	Y	1700	1.8													
07-07	IBY 450A4	F	N	9.0	Y	+20	+20	8390	70	30.22	64	3	98.0	P	3	N	1900	5.5	98.0	3	N	1900	5.5	N	96.9	86.0	A				
												2	101.0	P	3	N	1700	5.5													
												4	92.0	P	3	N	2200	5.5													
08-02	ICB P38A4	F	Y H	8.5	Y			6142	75	29.80	21	3	80.0	M	3	N	2250	1.5	F								N				
												2	84.0	M	3	N	2150	1.5													
												4	78.0	M	2	N	2800	1.0													
08-03	ICB P38A4	F	Y L	8.5	Y			6142	75	29.80	21	3	L						L												
												2	L																		
												4	L																		
08-28	ICB P38A4	F	Y H	8.5	Y			7562	73	30.06	85	3	L						L								N				
												2	L																		
												4	L																		
08-29	ICB P38A4	F	Y L	8.5	Y			7562	73	30.06	85	3	L						L												
												2	L																		
												4	L																		
29-01	ICB P38A4	F	Y H	8.5	Y			13002	70	30.10	58	3	90.5	M	2	N	2400	1.0	F					N			B	M	2	2100	1.0
												2	94.0	M	2	N	2400	1.0													
												4	88.0	M	2	N	2500	1.0													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THMR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	INIT	THR	GEAR	RPM	MV
29-02	ICB P38A4	F	Y	L	8.5	Y			13002	70	30.10	58	3	87.0	M	2	N	2350	1.0												
												2	90.0	M	2	N	2200	1.0													
												4	87.0	M	2	N	2300	1.0													
23-07	ICB P38A4	B	Y	H	8.5	Y			12120	68	29.09	56	3	82.0	M	4	Y	1300	0.6	78.0	4	Y	1300	2.0				N			
												2	84.0	M	4	Y	1300	0.6													
												4	83.0	M	4	Y	1300	0.6													
23-08	ICB P38A4	B	Y	L	8.5	Y			12120	68	29.09	56	3	82.0	M	4	Y	1200	0.6												
												2	84.0	M	4	Y	1200	0.6													
												4	81.0	M	4	Y	1200	0.6													
47-15	ICB P38A4	C	Y	H	8.5	Y			14400	70	29.92	50	3	84.0	M	4	Y	1300	0.5	F											
												2	84.0	M	4	Y	1300	0.5													
												4	80.0	M	4	Y	1400	0.5													
47-16	ICB P38A4	C	Y	L	8.5	Y			14400	70	29.92	50	3	78.0	M	4	Y	1300	0.5												
												2	80.0	M	4	Y	1450	0.5													
												4	78.0	M	4	Y	1400	0.5													
47-17	ICB P38A4	C	Y	H	8.5	Y			12835	70	30.02	50	3	82.0	M	4	Y	1300	0.5	F											
												2	82.0	M	4	Y	1400	0.5													
												4	81.0	M	3	N	2500	0.5													
47-18	ICB P38A4	C	Y	L	8.5	Y			12835	70	30.02	50	3	80.0	M	4	Y	1400	0.5	F											
												2	80.0	M	4	Y	1400	0.5													
												4	80.0	M	3	Y	2500	0.5													
26-06	ICB P38A4	F	Y	H	8.5	Y			23850	79	30.03	77	3	80.0	M	2	N	2100	0.2	L						92.0		N			
												2	80.0	M	2	N	2100	0.2													
												4	76.0	M	2	N	2000	0.2													
26-07	ICB P38A4	F	Y	L	8.5	Y			23850	79	30.03	77	3	L						L											
												2	L																		
												4	L																		
05-16	IEB P38A4	F	Y	H	8.5	Y			6012	78	30.09	44	3	87.0	M	3	N	2675	1.0	F											
												2	89.0	M	3	N	2700	1.0													
												4	84.0	M	3	N	2575	1.0													
05-17	IEB P38A4	F	Y	L	8.5	Y			6012	78	30.09	44	3	85.0	M	2	N	2550	1.0												
												2	86.0	M	2	N	2800	1.0													
												4	81.0	M	3	N	2425	1.0													
23-16	IEB P38A4	B	Y	H	8.5	Y			10632	68	29.06	56	3	84.0	M	3	N	2400	0.8	F								N			
												2	85.0	M	3	N	2400	0.8													
												4	82.0	M	3	N	2400	0.8													

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VEHICLE DESCRIPTION								WEATHER				OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION						
						SPARK ADVANCE							MAXIMUM						PART THROTTLE									RATER		
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWNK	OCT NO RES	OCT NO MOT	NITT	THR	GEAR	RPM	MV
23-17	IEB P38A4	B	Y L	8.5	Y			10632	68	29.06	56	3	L						L												
												2	L																		
												4	L																		
08-08	IGA 238A3	F	Y H	8.0	Y	+15	+15	6360	72	29.56	67	3	80.0	M	3	N	1750	1.0	F								N				
												2	85.0	M	3	N	1750	1.0													
												4	76.0	M	3	N	1650	1.0													
08-09	IGA 238A3	F	Y L	8.0	Y	+15	+15	6360	72	29.56	67	3	78.0	M	3	N	1700	1.0													
												2	78.0	M	3	N	1800	1.0													
												4	76.0	M	3	N	1650	1.0													
41-33	IGY 450A3	C	N	8.0	Y	+20	+20	12072	67	29.92	54	3	88.5	M	3	N	2200	1.0	F					N	93.2	83.1	N				
												2	89.0	M	3	N	2200	1.0													
												4	86.0	M	3	N	2200	1.0													
08-14	IGY 450A3	F	N	8.0	Y	+20	+20	6458	82	29.73	114	3	84.0	M	2	N	2300	0.5	F								N				
												2	85.0	M	2	N	2300	0.5													
												4	82.0	M	2	N	2300	0.5													
06-09	IGY 450A4	F	N	8.0	Y	+20	+20	8780	56	30.44	37	3	91.0	P	4	Y	1100	11.0	91.0	4	Y	1100	11.0								
												2	93.0	P	4	Y	1075	11.0													
												4	87.0	M	3	N	2100	0.8													
06-12	IH3 P38A4	F	Y H	8.5	Y			23705	73	29.75	100	3	86.0	M	2	N	1900	1.3	F												
												2	88.0	M	2	N	1900	1.3													
												4	82.0	M	4	Y	1300	1.2													
06-13	IH3 P38A4	F	Y L	8.5	Y			23705	73	29.75	100	3	81.0	M	2	N	1800	1.3	F												
												2	83.0	M	2	N	1800	1.3													
												4	81.0	M	4	Y	1250	1.2													
23-09	IH3 P38A4	B	Y H	8.5	Y			7826	77	28.93	64	3	82.0	M	4	Y	1300	0.6	78.0	4	Y	1300	3.0				N				
												2	82.0	M	4	Y	1300	0.6													
												4	82.0	M	4	Y	1300	0.6													
23-10	IH3 P38A4	B	Y L	8.5	Y			7826	77	28.93	64	3	L						L												
												2	L																		
												4	L																		
26-28	IH3 P38A4	F	Y H	8.5	Y			9057	71	29.90	50	3	84.0	M	3	N	2250	0.7	L					N	91.4		N				
												2	88.0	M	3	Y	1500	1.0													
												4	81.0	M	4	Y	1350	0.7													
26-29	IH3 P38A4	F	Y L	8.5	Y			9057	71	29.90	50	3	L						L												
												2	79.0	M	4	Y	1400	0.7													
												4	77.0	M	4	Y	1300	0.7													

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VEHICLE DESCRIPTION						SPARK ADVANCE			WEATHER			OCTANE NUMBER REQUIREMENT DATA	MAXIMUM					PART THROTTLE					TANK FUEL INFORMATION			RATER				
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWNK	OCT NO RES	OCT NO MOT	NINT	THR	SEAR	RPM	MV
26-30	IH3 P38A4	F	Y H	8.5	Y			6173	72	30.14	50	3	78.0	M	2	N	2250	0.5	L						98.6		N				
												2	L																		
												4	L																		
26-31	IH3 P38A4	F	Y L	8.5	Y			6173	72	30.14	50	3	L						L												
												2	L																		
												4	L																		
29-04	INL P30A3	F	Y H	9.0	Y			12806	70	30.01	60	3	92.0	M	3	Y	1900	1.4	90.0	3	Y	1800	3.0	Y			A	M	3	2000	1.4
												2	94.0	M	3	Y	1900	1.4													
												4	88.5	M	3	Y	1950	1.4													
29-05	INL P30A3	F	Y L	9.0	Y			12806	70	30.01	60	3	90.0	M	3	N	2500	1.3													
												2	93.0	M	3	Y	1950	1.4													
												4	88.0	M	3	Y	1950	1.4													
65-36	INL P30A3	F	Y H	9.0	Y			12930	66	29.45	58	3	95.0	M	3	Y		1.0	92.5	3	Y		2.0	N	96.9	86.1	N				
												2	96.0	M	3	Y		1.0													
												4	93.5	M	3	Y		1.0													
65-37	INL P30A3	F	Y L	9.0	Y			12930	66	29.45	58	3	94.0	M	3	Y		1.0	92.5	3	Y		2.0								
												2	95.0	M	3	Y		1.0													
												4	93.5	M	3	Y		1.0													
47-33	INL P30A3	C	Y H	9.0	Y			31414	70	30.02	50	3	94.0	M	3	N	2900	1.2	F												
												2	97.0	M	3	N	2950	1.2													
												4	92.0	M	3	Y	1900	1.0													
47-34	INL P30A3		Y L	9.0	Y			31414	70	30.02	50	3	93.0	M	3	N	2900	1.2	F												
												2	96.0	M	3	N	2900	1.2													
												4	91.0	M	3	Y	2050	1.0													
08-10	INU T25A3	F	N	9.0	Y	+ 8	+ 8	6525	80	29.83	54	3	89.0	M	3	Y	1500	2.0	88.0	3	Y	1450	4.0				N				
												2	90.0	M	3	Y	1450	2.0													
												4	86.0	M	3	Y	1450	2.0													
08-20	INU T25A3	F	N	9.0	Y	+ 8	+ 8	7259	75	29.99	49	3	92.0	M	3	Y	1600	2.5	91.0	3	Y	1300	7.0				B	M	3	1650	2.5
												2	93.0	M	3	Y	1600	2.5													
												4	86.0	M	3	Y	1600	2.5													
29-09	INU T25A3	F	N	9.0	Y	+ 8	+ 8	12961	70	30.10	60	3	90.5	M	3	Y	2000	2.0	90.5	3	Y	1400	3.5	N			N				
												2	90.5	M	3	Y	2000	2.0													
												4	86.0	M	3	N	2700	1.5													
60-01	INU T25A3	F	N	9.0	Y	+ 8	+ 8	10535	70	30.34	58	3	88.0	M	3	Y	1600	1.7	86.0	3	Y	1550	8.0	N			N				
												2	89.0	M	3	Y	1450	1.7													
												4	88.0	M	3	Y	1950	1.7													

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VEHICLE DESCRIPTION										WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
														MAXIMUM						PART THROTTLE								RATER				
							SPARK ADVANCE																			OCT NO						
OBS NO	MODEL	CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWKNK	RES	MOT	NINT	THR	GEAR	RPM	MV
07-03	JA	220M5	F	N	9.1	Y	+22	+22	7086	68	30.08	66	3	88.0	M	4	N	2350	1.2	86.0	4	N	2050	2.2	N	92.5	82.7	N				
													2	88.0	M	4	N	2550	1.2													
													4	86.0	M	4	N	2400	1.2													
28-10	JA	P20A4	F	N	8.8	Y	+15	+15	10619	70	29.53	63	3	84.5	M	2	N	3000	0.5	F					N			N				
													2	87.0	M	2	N	3700	0.5													
													4	84.0	M	3	N	2500	0.5													
47-24	KED	T22A3	C	N	9.5				10800	70	30.00	50	3	88.0	M	3	N	2800	1.0	38.0	3	N	1800	11.0								
													2	90.0	M	3	N	2750	1.0													
													4	87.0	M	3	N	2800	1.0													
47-32	KED	T22A3	C	N	9.5	Y	+12	+12	12300	70	30.05	50	3	88.0	M	3	N	2600	0.5	96.0	3	N	1600	10.0								
													2	89.0	M	3	N	2600	0.5													
													4	88.0	M	3	N	2700	0.5													
65-01	KEE	TP22A3	F	Y H	8.1	Y	+12	+12	11576	77	29.52	59	3	93.0	P	3	N	3000	-3.0	93.0	3	N	3000	-3.0				N				
													2	95.0	M	3	N	2700	-3.0													
													4	92.5	M	3	N	3000	-6.0													
65-02	KEE	TP22A3	F	Y L	8.1	Y	+12	+12	11576	77	29.52	59	3	92.5	P	3	N	3000	-4.0	92.5	3	N	3000	-4.0				N				
													2	94.5	M	3	N	2700	-3.0													
													4	92.5	M	3	N	3000	-4.0													
08-24	KHD	T22A3	A	N	9.5	Y	+12	+12	10907	73	29.95	85	3	86.0	M	3	N	2600	1.0	84.0	3	N	1950	3.5				N				
													2	87.0	M	3	N	2600	1.0													
													4	84.0	M	3	N	2300	1.0													
40-01	KHK	T25A3	F	N	9.0	Y	+12	+12	10300	56	30.21	53	3	93.0	P	3	N	1950	7.0	93.0	3	N	1950	7.0				N				
													2	96.0	P	3	N	1700	7.0													
													4	90.5	M	2	N	2500	1.0													
40-02	KHK	T25A3	F	N	9.0	Y	+12	+12	10419	65	29.87	51	3	91.0	M	2	N	2200	1.0							92.0	84.0	N				
													2	88.0	M	3	N	2700	1.0													
													4	90.0	M	2	N	2200	1.0													
07-31	KHK	T25A3	F	N	9.0	Y	+12	+12	12186	68	30.14	56	3	88.0	M	2	N	3150	1.0	94.0	2	N	1950	6.5	N			N				
													2	88.0	M	3	N	3000	0.9													
													4	85.0	M	2	N	3000	1.0													
29-12	KKD	T22A3	F	N	9.5	Y	+12	+12	19936	70	30.01	65	3	96.0	M	3	N	2100	1.0	95.0	3	N	2000	2.0	N			A	N	3	1900	1.0
													2	96.5	P	3	N	2300	2.0													
													4	92.0	M	3	N	2000	1.0													
28-15	KKD	T22A3	F	N	9.5	Y	+12	+12	11385	70	29.22	47	3	89.0	M	2	N	2200	0.5	F					N			N				
													2	91.0	M	2	N	2900	0.5													
													4	89.0	M	2	N	2200	0.5													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																									
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWNK	OCT NO RES	OCT NO MOT	NINT	THR	GEAR	RPM	MV
40-95	KKB T22A3	F	N	9.5	Y	+12	+12	12245	66	29.89	59	3	88.5	M	3	N	2400	1.0	86.5	3	N	2100	2.0		92.0	84.0	N				
												2	89.0	M	3	N	2400	1.0													
												4	88.5	M	3	N	2500	1.0													
06-01	KKK T25A3	F	N	9.0	Y	+14	+12	9096	84	29.82	123	3	88.0	M	3	N	2200	0.5	88.0	3	N	2200	1.8	N	93.1	81.9	N				
												2	90.0	M	3	N	2200	0.5													
												4	88.0	M	3	N	2300	0.5													
28-11	KKK T25A3	F	N	9.0	Y	+12	+12	10956	70	29.42	51	3	87.0	M	2	N	2200	0.7	F					N			N				
												2	88.0	M	2	N	2200	0.7													
												4	86.0	M	2	N	2200	0.7													
05-34	KKK T25A3	F	N	9.0	Y	+12	+12	7862	68	30.05	63	3	84.0	M	2	N	2175	1.0	81.0	3	N	2125	3.0	N	92.1	82.7	N				
												2	85.0	M	2	N	2150	1.0													
												4	82.0	M	2	N	2200	1.0													
07-11	KKK T25A3	F	N	9.0	Y	+12	+12	12528	68	30.16	54	3	85.0	M	3	N	2700	0.9	82.0	3	N	2250	3.5	N	92.8	82.3	N				
												2	87.0	M	3	N	2900	0.9													
												4	84.0	M	3	N	2650	0.9													
29-18	KLC 222A3	F	N	9.0	Y	+10	+10	28765	70	30.20	68	3	99.0	P	3	N	2100	5.0						Y			A	N	3	2200	1.2
												2	99.5	P	3	N	2250	5.0													
												4	96.0	P	3	N	1950	5.0													
07-08	KMP 252A3	F	Y H	9.1	Y	+ 7	+ 7	7982	70	30.27	66	3	87.0	M	3	N	1950	1.6	86.0	4	N	1450	4.5	N	92.6	82.4	N				
												2	89.0	M	2	N	3400	1.4													
												4	86.0	M	4	N	1450	0.6													
07-06	KMP 252A3	F	Y L	9.1	Y	+ 7	+ 7	7982	70	30.27	66	3	86.0	M	2	N	3350	1.4	84.0	4	N	1450	4.5								
												2	88.0	M	2	N	3350	1.4													
												4	84.0	M	4	N	1600	0.6													
65-30	LA3 P38A4	F	Y H	8.5	Y			13647	62	29.55	46	3	97.5	P	4	Y	1400	4.0	97.5	4	Y	1400	4.0				A	N	4	1450	0.0
												2	98.5	P	4	Y	1400	4.0													
												4	95.5	M	4	Y	1400	0.0													
65-31	LA3 P38A4	F	Y L	8.5	Y			13647	62	29.55	46	3	97.5	P	4	Y	1400	4.0	97.5	4	Y	1400	4.0								
												2	98.5	P	4	Y	1400	4.0													
												4	95.5	M	4	Y	1400	0.0													
65-34	LA3 P38A4	F	Y H	8.5	Y			9842	47	29.35	29	3	95.0	M	4	Y	1600	1.0	95.0	4	Y	1700	2.0				A	N	4	1600	1.0
												2	97.0	M	4	Y	1600	1.0													
												4	93.5	M	4	Y	1600	1.0													
65-35	LA3 P38A4	F	Y L	8.5	Y			9842	47	29.35	29	3	95.0	M	4	Y	1600	1.0	95.0	4	Y	1700	2.0								
												2	97.0	M	4	Y	1600	1.0													
												4	93.5	M	4	Y	1600	1.0													

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OBS NO	MODEL CODE	ENG T	KNK SEN	C.R.	AIR	SPARK ADVANCE AG RCD	SPARK ADVANCE AG TST	ODOM MILES	WEATHER AMB TMP	WEATHER BAROM	WEATHER HUM	FUEL	MAXIMUM OCT NO	MAXIMUM TECH R	MAXIMUM GEAR	MAXIMUM CONV	MAXIMUM RPM	MAXIMUM MV	PART THROTTLE OCT NO	PART THROTTLE GEAR	PART THROTTLE CONV	PART THROTTLE RPM	PART THROTTLE MV	OWNER K	OCT NO RES	OCT NO MOT	RATER NIT	RATER TECH R	RATER GEAR	RATER RPM	RATER MV
07-15	LA3 P38A4	F	Y	M	8.5	Y			16028	69	30.15	52	3	83.0	M	3	N	2800	1.2	F					N	92.6	82.6	N				
													2	85.0	M	4	Y	1700	1.3													
													4	94.0	M	4	Y	1600	1.3													
07-16	LA3 P38A4	F	Y	L	8.5	Y			16028	69	30.15	52	3	82.0	M	4	Y	1500	1.3													
													2	84.0	M	4	Y	1600	1.3													
													4	83.0	M	4	Y	1600	1.3													
41-18	LAR T25A3	C	N		9.0	Y	+8	+8	6665	64	30.04	47	3	92.0	M	3	Y	1800	2.0	F						93.2	82.6	8	M	3	1800	2.0
													2	92.0	M	3	Y	1800	2.0													
													4	89.0	M	3	Y	1800	2.0													
41-29	LAR T25A3	C	N		9.0	Y	+8	+8	25506	71	30.08	56	3	94.0	M	3	Y	1800	1.4	F						93.8	83.7	B	M	3	1800	1.4
													2	95.0	M	3	Y	1800	1.4													
													4	92.0	M	3	Y	1800	1.4													
29-10	LAR T25A3	F	N		9.0	Y	+8	+8	11092	70	30.01	60	3	96.0	M	3	Y	1700	1.4	92.0	3	Y	1900	2.5	Y			A	M	2	2700	1.1
													2	96.0	M	3	N	2300	1.2													
													4	91.0	M	3	N	2300	1.2													
06-05	LAR T25A3	F	N		9.0	Y	+8	+8	8777	82	29.68	108	3	93.0	M	3	Y	1800	1.4	F					Y	93.5	82.7	A	M	3	1800	1.4
													2	95.0	M	3	Y	1800	1.4													
													4	88.0	M	3	Y	1800	1.4													
23-18	LAR T25A3	B	N		9.0	Y	+11	+8	8108	54	29.11	54	3	92.0	M	3	Y	1600	1.5	88.0	3	Y	1700	2.0				M				
													2	92.0	M	3	Y	1600	1.5													
													4	91.0	M	3	Y	1600	1.5													
05-41	LCB P38A4	F	Y	H	8.5	Y			6109	70	30.12	54	3	86.0	M	3	N	2300	0.6	F						92.5	82.8	B	M	3	2350	0.8
													2	87.0	M	3	N	2300	0.6													
													4	86.0	M	3	N	2450	0.8													
05-42	LCB P38A4	F	Y	L	8.5	Y			6109	70	30.12	54	3	86.0	M	3	N	2300	0.6													
													2	87.0	M	3	N	2300	0.6													
													4	86.0	M	3	N	2450	0.8													
23-20	LCB P38A4	B	Y	H	8.5	Y			11838	60	29.36	24	3	80.0	M	3	N	2500	0.6	L								M				
													2	80.0	M	3	N	2600	0.6													
													4	L																		
23-21	LCB P38A4	B	Y	L	8.5	Y			11838	60	29.36	24	3	L						L												
													2	L																		
													4	L																		
65-03	LCB P38A4	F	Y	H	8.5	Y			10384	73	29.75	98	3	92.0	M	4	Y	3000	2.5									M				
													2	93.0	M	4	Y	3000	2.5													
													4	91.0	M	4	Y	3000	2.5													

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	VEHICLE DESCRIPTION								WEATHER				OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE									RATER				
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	NINT	THR	SEAR	RPM	MV
65-04	LCB P38A4	F	Y L	8.5	Y			10384	73	29.75	98	3	91.0	N	4	Y	3000	2.5									N				
												2	92.5	N	4	Y	3000	2.5													
												4	90.5	N	4	Y	3000	2.5													
46-08	LCB P38A4	F	Y H	8.5	Y			7949	74	29.19	84	3	L						L					N	93.9	85.3	N				
												2	L																		
												4	L																		
46-09	LCB P38A4	F	Y L	8.5	Y			7949	74	29.19	84	3	L						L												
												2	L																		
												4	L																		
07-28	LCB P38A4	F	Y H	8.5	Y			6999	68	30.23	58	3	88.0	N	3	N	2600	1.0	86.0	4	Y	1500	5.5	N			B	N	2	3300	0.7
												2	89.0	N	2	N	2800	0.7													
												4	85.0	N	3	N	2600	1.0													
07-29	LCB P38A4	F	Y L	8.5	Y			6999	68	30.23	58	3	86.0	N	4	N	2600	1.0	84.0	4	Y	1550	5.5								
												2	87.0	N	2	N	2700	0.7													
												4	83.0	N	3	N	2750	1.0													
28-08	LEB P38A4	F	Y H	8.5	Y			10468	70	29.44	62	3	83.0	N	4	Y	1550	0.5	F					Y			Y				
												2	84.0	N	4	Y	1450	0.5													
												4	83.0	N	4	Y	1325	0.5													
28-09	LEB P38A4	F	Y L	8.5	Y			10468	70	29.44	62	3	79.0	N	4	Y	1300	0.5													
												2	81.0	N	4	Y	1325	0.5													
												4	79.0	N	4	Y	1325	0.5													
23-26	LEB P38A4	B	Y H	8.5	Y			9622	62	29.08	44	3	82.0	N	4	Y	1350	0.8	92.0	4	Y	1300	2.0				N				
												2	84.0	N	4	Y	1350	0.8													
												4	82.0	N	4	Y	1350	0.8													
23-27	LEB P38A4	B	Y L	8.5	Y			9622	62	29.08	44	3	L						L												
												2	L																		
												4	L																		
28-19	LGA 238A3	F	Y H	8.0	Y	+15	+15	10703	70	29.45	50	3	87.0	N	2	N	1600	0.5	F								N				
												2	87.0	N	2	N	1600	0.5													
												4	85.0	N	2	N	1600	0.5													
28-20	LGA 238A3	F	Y L	8.0	Y	+15	+15	10703	70	29.45	50	3	86.0	N	2	N	1700	0.5	F												
												2	86.0	N	2	N	1600	0.5													
												4	84.0	N	2	N	1700	0.5													
07-25	LBY 450A3	F	N	8.0	Y	+20	+20	7054	70	29.96	53	3	89.0	N	3	Y	2050	1.8	86.0	3	Y	1900	6.0	N	91.7	82.5	N				
												2	89.0	N	2	N	2700	1.2													
												4	86.0	N	2	N	3050	1.2													

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OBS NO	MODEL CODE	ENG CT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	MAXIMUM OCT NO	MAXIMUM TRNR	MAXIMUM GEAR	MAXIMUM CONV	MAXIMUM RPM	MAXIMUM MV	PART THROTTLE OCT NO	PART THROTTLE GEAR	PART THROTTLE CONV	PART THROTTLE RPM	PART THROTTLE MV	ONKNK	TANK FUEL OCT NO RES	TANK FUEL OCT NO MOT	RATER M[illegible]	RATER TRNR	RATER GEAR	RATER RPM	RATER MV
23-47	LGY 450A4	F	N	8.0	Y	+18	+20	10200	58	29.32	24	3	89.0	M	4	Y	1100	1.4	89.0	4	Y	1100	2.5				M				
												2	89.0	M	4	Y	1100	1.4													
												4	88.0	M	4	Y	1100	1.4													
05-02	LH3 P38A4	F	Y H	8.5	Y			7619	70	29.92	56	3	82.0	M	4	Y	1190	0.8	F								A	M	4	1280	0.8
												2	83.0	M	4	Y	1220	0.8													
												4	80.0	M	4	Y	1240	0.8													
05-03	LH3 P38A4	F	Y L	8.5	Y			7619	70	29.92	56	3	82.0	M	4	Y	1190	0.8	F												
												2	83.0	M	4	Y	1220	0.8													
												4																			
40-10	LH3 P38A4	F	Y H	8.5	Y			13040	53	29.94	41	3	90.0	M	2	N	2700	1.0	86.0	4	Y	1300	1.5		92.0	84.0	N				
												2	91.0	M	2	N	2700	1.0													
												4	89.0	M	2	N	2700	1.0													
40-11	LH3 P38A4	F	Y L	8.5	Y			13040	53	29.94	41	3	90.0	M	2	N	2700	1.0	86.0	4	Y	1300	1.5								
												2	90.0	M	2	N	2500	1.0													
												4	88.0	M	4	Y	1300	1.0													
40-12	LH3 P38A4	F	Y H	8.5	Y			12673	45	30.13	44	3	90.0	M	3	Y	1650	1.0	F						92.0	84.0	N				
												2	91.0	M	3	Y	1600	1.0													
												4	89.0	M	3	Y	1700	1.0													
40-13	LH3 P38A4	F	Y L	8.5	Y			12673	45	30.13	44	3	90.0	M	3	Y	1650	1.0	F												
												2	90.0	M	3	Y	1400	1.0													
												4	89.0	M	3	Y	1700	1.0													
65-09	LH3 P38A4	F	Y H	8.5	Y			10430	64	29.64	43	3	97.0	M	4	Y	2400	1.5	F								A	M	4	2500	1.5
												2	97.0	M	4	Y	2000	1.5													
												4	93.0	M	4	Y	2400	1.5													
65-10	LH3 P38A4	F	Y L	8.5	Y			10430	64	29.64	43	3	94.0	M	4	Y	2400	1.5	F												
												2	95.0	M	4	Y	2000	1.[illegible]													
												4	89.0	M	4	Y	2400	1.5													
28-17	LHL P30A4	F	Y H	9.0	Y			12245	70	29.38	50	3	85.0	M	2	N	2200	1.0	83.0	4	Y	1300	2.0				N				
												2	86.0	M	2	N	2100	1.0													
												4	84.0	M	2	N	2100	1.0													
28-18	LHL P30A4	F	Y L	9.0	Y			12245	70	29.38	50	3	84.0	M	2	N	2400	1.0													
												2	85.0	M	2	N	2100	1.0													
												4	83.0	M	2	N	2100	1.0													
07-26	LHL P30A4	F	Y H	9.0	Y			7834	70	30.34	53	3	89.0	M	3	N	1950	0.7	87.0	4	Y	1600	5.0	0	94.2	83.4	N				
												2	91.0	M	2	N	3350	0.7													
												4	88.0	M	2	N	3350	0.7													

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OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	WEATHER AMB TMP	WEATHER BAROM	WEATHER HUM	FUEL	MAXIMUM OCT NO	MAXIMUM TMR	MAXIMUM GEAR	MAXIMUM CONV	MAXIMUM RPM	MAXIMUM MV	PART THROTTLE OCT NO	PART THROTTLE GEAR	PART THROTTLE CONV	PART THROTTLE RPM	PART THROTTLE MV	TANK FUEL JUNK	OCT NO RES	OCT NO MOT	RATER NINT	RATER THR	RATER GEAR	RATER RPM	RATER MV
07-27	LWL P30A4	F	Y L	9.0	Y			7834	70	30.34	53	3	87.0	M	2	N	3000	0.7	86.0	4	Y	1600	5.0								
												2	89.0	M	3	N	2850	0.7													
												4	87.0	M	2	N	3050	0.7													
05-01	LJO T18W5	F	N	8.2	Y	+ 5	+ 8	13121	68	30.39	84	3	92.0	M	4	N	1750	0.5	F					Y	92.0	82.5	A	N	4	2000	0.5
												2	94.0	M	4	N	1750	0.5													
												4	92.0	M	4	N	1750	0.5													
08-27	LJP T20A3	F	N	9.3	Y	+ 6	+ 6	18097	72	29.70	54	3	85.0	M	2	N	3100	0.8	82.0	3	N	2300	5.0				N				
												2	86.0	M	2	N	3100	0.8													
												4	84.0	M	3	N	2550	1.0													
07-24	LJP T20A3	F	N	9.0	Y	+ 6	+ 6	10085	69	30.19	48	3	92.0	M	3	Y	3000	0.8	89.0	3	Y	2450	5.0	N			N				
												2	93.0	M	3	Y	3400	0.8													
												4	90.0	M	3	N	3050	0.8													
28-24	LWL P30A3	F	Y H	9.0	Y			25526	70	29.46	50	3	91.0	M	2	N	2400	0.5	90.0	3	Y	1700	2.5				N				
												2	93.0	M	2	N	2400	0.5													
												4	89.0	M	2	N	2400	0.5													
28-25	LWL P30A3	F	Y L	9.0	Y			25526	70	29.46	50	3	91.0	M	2	N	2400	0.5	90.0	3	Y	2700	2.5								
												2	93.0	M	2	N	2400	0.5													
												4	89.0	M	2	N	2400	0.5													
28-32	LWL P30A3	F	Y H	9.0	Y			28986	70	29.28	50	3	90.0	M	2	N	2400	0.5	F								N				
												2	91.0	M	2	N	2400	0.5													
												4	88.0	M	2	N	2500	0.5													
28-33	LWL P30A3	F	Y L	9.0	Y			28986	70	29.28	50	3	89.0	M	2	N	2400	0.5	85.0	3	Y	1600	2.0								
												2	91.0	M	2	N	2400	0.5													
												4	88.0	M	2	N	2500	0.5													
41-01	LWU T25A3	C	N	9.0	Y	+ 8	+ 8	6957	69	30.06	50	3	85.0	M	2	N	2900	1.2	F						92.3	32.4	N				
												2	86.0	M	2	N	2900	1.2													
												4	83.0	M	2	N	3000	1.2													
28-14	LWU T25A3	F	N	9.0	Y	+ 8	+ 8	9818	70	29.32	46	3	87.0	M	3	N	2200	1.0	F					N			N				
												2	88.0	M	3	N	2200	1.0													
												4	87.0	M	3	N	2300	0.7													
40-07	LWU T25A3	F	N	9.0	Y	+ 8	+ 8	12030	59	29.88	52	3	95.0	P	3	Y	1500	4.0	95.0	3	Y	1500	4.0		92.0	84.0	A	N	2	3000	1.0
												2	96.0	P	3	Y	1500	5.0													
												4	95.0	M	3	N	2500	1.5													
65-17	LWU T25A3	F	N	9.0	Y	+ 8	+ 8	12840	54	29.89	40	3	94.5	M	3	Y	1900	1.0	F								N				
												2	96.5	M	3	Y	1500	1.0													
												4	92.5	M	3	Y	1600	1.0													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
					SPARK ADVANCE								MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	ENG CT	KNK SEN	C.R.	AIR	AG RCD	AG TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	TECH R	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	NITR	TECH R	GEAR	RPM	MV
47-23	LMU T25A3	C	N	9.0	Y	+ 8	+ 8	8500	70	30.07	50	3	98.0	P	3	Y	1400	8.0	98.0	3	Y	1400	8.0								
												2	97.0	M	3	Y	1900	1.2													
												4	89.0	M	3	Y	1700	1.2													
62-01	ME9 219N4	F	N	9.0	N	+10	+10	12755	68	30.21	59	3	88.0	M	4	N	1450	0.3	86.0	4	N	1200	2.0	N	92.0	82.0	N				
												2	89.0	M	4	N	1550	0.3													
												4	86.0	M	4	N	1400	0.3													
60-03	ME9 219N4	F	N	9.0	N	+10	+10	8357	72	30.19	61	3	90.0	M	4	N	1500	0.2	89.0	4	N	1350	1.2	N	91.7	82.2	B	M	4	1400	0.2
												2	91.0	M	4	N	1550	0.2													
												4	88.0	M	4	N	1450	0.2													
72-01	ME9 219N5	F	N	9.0	Y	+12	+12	17843	85	29.28	63	3	87.0	P	4	N	1500	1.0	87.0	4	N	1500	1.0	N			N				
												2	86.0	M	4	N	1300	0.1													
												4	87.0	P	4	N	1700	1.0													
32-11	ME9 219N5	F	N	9.0	Y	+10	+10	7481	85	29.52	65	3	88.0	M	4	N	2200	0.3	87.0	4	N	1800	2.0	N			N				
												2	89.0	M	4	N	2200	0.3													
												4	89.0	M	4	N	1700	0.3													
07-14	MEJ P19N5	F	N	9.0	Y	+10	+10	16251	64	30.34	52	3	90.0	M	4	N	1750	0.5	F					Y	96.1	85.2	N				
												2	91.0	M	3	N	1950	0.5													
												4	87.0	M	3	N	2300	0.5													
32-32	MLC T38A3	F	N	8.7	Y	+10	+10	17384	86	29.61	66	3	85.0	M	3	N	1800	3.0	84.0	3	N	1500	4.0	Y			N				
												2	86.0	M	3	N	1600	3.0													
												4	87.0	M	2	N	2000	0.9													
32-14	MPF P50A4	F	N	8.9	Y	+10	+10	14015	85	29.28	64	3	86.0	M	4	N	1200	1.4	86.0	4	N	1100	4.0	N			N				
												2	86.0	M	4	N	1100	1.4													
												4	86.0	M	4	N	1100	1.4													
32-20	MPF P50A4	F	N	8.9	Y	+10	+10	6777	85	29.78	65	3	92.0	M	3	N	2200	0.5	91.0	4	N	1100	3.0	N			B	M	4	1400	0.3
												2	92.0	M	3	N	2200	0.3													
												4	93.0	M	4	N	1300	0.5													
32-21	MPF P50A4	F	N	8.9	Y	+10	+10	6484	85	29.59	65	3	91.0	M	4	N	1300	1.2	90.0	4	N	900	4.0	N			A	M	4	900	1.2
												2	90.0	M	4	N	900	1.2													
												4	92.0	M	4	N	1350	1.2													
32-27	MPF P50A4	F	N	8.9	Y	+10	+10	17307	86	29.54	64	3	93.0	M	4	N	850	1.5	91.0	4	N	850	3.0	N			N				
												2	91.0	M	4	N	850	1.5													
												4	89.0	M	3	N	1500	1.0													
65-40	MPF P50A4	F	N	8.9	Y	+10	+10	12526	69	29.44	50	3	92.5	M	4	N	1150	1.5	90.5	4	N	1150	3.0	N	93.6	83.0	B	M	4	1200	1.5
												2	93.0	M	4	N	1150	1.5													
												4	95.5	M	4	N	1150	1.5													

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VEHICLE DESCRIPTION										WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
							SPARK ADVANCE							MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE		ENCT	KNK	SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	TECH	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWN KNK	OCT NO RES	OCT NO MOT	NINT	THR	GEAR	RPM	MV
06-22	MPF	P50A4	F	N		8.9	Y	+10	+10	15314	33	30.52	58	3	90.0	M	4	N	1100	0.4	90.0	4	N	1100	1.4								
														2	90.0	M	4	N	1050	0.4													
														4	92.0	M	4	N	1100	0.4													
07-34	MPF	P50A4	F	N		8.9	Y	+10	+10	13776	70	30.07	51	3	88.0	M	4	N	1300	1.5	88.0	3	N	1100	3.0	N	93.5	83.0	B	M	3	1950	0.8
														2	90.0	M	4	N	1400	1.5													
														4	89.0	M	4	N	1250	0.8													
41-21	MRU	P30A4	C	Y	H	9.2	Y	+10	+10	13116	63	30.01	58	3	96.0	M	3	N	2300	0.8	F						93.3	83.7	B	M	3	2300	0.8
														2	97.0	M	3	N	2300	0.8													
														4	95.0	M	3	N	2300	0.8													
41-22	MRU	P30A4	C	Y	L	9.2	Y	+10	+10	13116	63	30.01	58	3	86.0	M	3	N	2300	0.8													
														2	86.0	M	3	N	2300	0.8													
														4	84.0	M	3	N	2300	0.8													
32-04	MRU	P30A4	F	Y	H	9.3	Y			9421	85	29.39	63	3	84.0	M	4	Y	2150	0.5	82.0	4	Y			N			N				
														2	86.0	M	4	Y	2150	0.5													
														4	84.0	M	4	Y	2100	0.5													
32-05	MRU	P30A4	F	Y	L	9.3	Y			9421	85	29.39	63	3	84.0	M	4	Y	2100	0.5													
														2	82.0	M	4	Y	2100	0.5													
														4	82.0	M	4	Y	2100	0.5													
32-08	MRU	P30A4	F	Y	H	9.3	Y	+10	+10	12253	85	29.42	65	3	87.5	M	4	Y	1200	1.5	86.5	4	Y	1200	3.0	N			N				
														2	89.5	M	4	Y	1200	1.5													
														4	87.5	M	4	Y	1200	1.5													
32-09	MRU	P30A4	F	Y	L	9.3	Y	+10	+10	12253	85	29.42	65	3	86.5	P	4	Y	1200	3.0	86.5	4	Y	1200	3.0								
														2	86.5	M	2	N	3800	0.8													
														4	86.5	P	4	Y	1200	3.0													
32-12	MRU	P30A4	F	Y	H	9.3	Y	+10	+10	10302	86	29.50	64	3	87.0	M	4	Y	1300	1.3	87.0	4	Y	1250	2.0	N			N				
														2	87.0	M	4	Y	1300	1.3													
														4	87.0	M	4	Y	1300	1.3													
32-13	MRU	P30A4	F	Y	L	9.3	Y	+10	+10	10302	86	29.50	64	3	86.0	M	4	Y	1300	1.3													
														2	86.0	M	4	Y	1300	1.3													
														4	86.0	M	4	Y	1300	1.3													
32-30	MRU	P30A4	F	Y	H	9.3	Y	+10	+10	7715	85	29.67	63	3	93.0	M	4	Y	1350	0.5	93.0	4	Y	1300	3.0	N			B	M	4	1600	0.5
														2	93.0	M	4	Y	1400	0.5													
														4	92.0	M	4	Y	1300	0.5													
32-31	MRU	P30A4	F	Y	L	9.3	Y	+10	+10	7715	85	29.67	63	3	86.0	M	4	Y	1600	0.5													
														2	86.0	M	4	Y	1600	0.5													
														4	85.0	M	4	Y	1600	0.5													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	TECH R	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWKNK	OCT NO RES	OCT NO MOT	NINT	TECH	GEAR	RPM	MV
32-36	MRU P30A4	F	Y H	9.3	Y	+10	+10	18346	85	29.66	64	3	89.0	M	4	Y	1250	1.8	87.0	4	Y	1300	3.0	N			N				
												2	89.0	M	4	Y	1250	1.8													
												4	88.0	M	4	Y	1250	1.3													
32-37	MRU P30A4	F	Y L	9.3	Y	+10	+10	18346	85	29.66	64	3	86.0	M	4	Y	1250	1.8													
												2	86.0	M	4	Y	1250	1.8													
												4	86.0	M	4	Y	1250	1.8													
32-38	MRU P30A4	F	Y H	9.3	Y	+10	+10	11576	86	30.00	64	3	90.0	M	4	Y	1400	0.7	90.0	4	Y	1400	2.0	N			N				
												2	88.0	M	4	Y	1800	0.7													
												4	88.0	M	4	Y	1400	0.7													
32-39	MRU P30A4	F	Y L	9.3	Y	+10	+10	11576	86	30.00	64	3	82.0	M	3	Y	2200	0.5	84.0	4	Y	1400	2.0								
												2	84.0	M	3	Y	2300	0.7													
												4	84.0	M	3	Y	3000	0.5													
32-15	MS3 T38A3	F	N	8.7	Y	+10	+10	9617	85	29.40	65	3	84.0	M	3	N	1700	1.6	84.0	3	N	1700	3.0	N			N				
												2	86.0	M	3	N	1750	1.6													
												4	84.0	M	3	N	1750	1.6													
07-36	MTS T23M5	F	N	9.0	Y	+10	+10	6915	74	30.15	64	3	86.0	M	3	N	2200	0.7	85.0	4	N	2400	4.5	N	94.2	83.7	N				
												2	87.0	M	4	N	1900	0.6													
												4	84.0	M	4	N	2150	0.6													
32-02	MTX T23A3	F	N	9.0	Y			8220	84	29.43	65	3	91.0	M	2	N	2000	0.6	91.0	3	N	1250	2.0	N			9	M	2	2000	0.6
												2	92.0	M	2	N	2600	0.6													
												4																			
32-07	MTX T23A3	F	N	9.0	Y	+10	+10	9071	86	29.22	64	3	87.0	M	3	N	1300	1.4	87.0	3	N	1300	2.0	N			N				
												2	86.0	M	3	N	1400	1.4													
												4	87.0	M	3	N	1500	1.4													
41-09	NAR T25A3	C	N	9.0	Y	+ 8	+ 8	13467	67	29.95	54	3	89.5	M	3	Y	2100	2.0	F						92.9	83.7	8	M	3	2100	2.0
												2	91.0	M	3	Y	2100	2.0													
												4	87.0	M	3	Y	2100	2.0													
08-04	NAR T25A3	F	N	9.0	Y	+ 8	+ 8	8612	76	29.79	45	3	92.0	M	3	Y	1650	2.0	F								A	M	3	1800	2.0
												2	93.0	M	3	N	2500	1.5													
												4	85.0	M	3	N	2350	1.5													
06-04	NAR T25A3	F	N	9.0	Y	+ 8	+ 8	8220	80	30.04	78	3	97.0	M	3	Y	1700	1.3	F					N	97.8	98.4	N				
												2	97.0	M	3	Y	1700	1.3													
												4	92.0	M	3	Y	1700	1.3													
23-01	NAR T25A3	B	N	9.0	Y	+11	+ 8	10066	77	29.02	84	3	89.0	M	3	Y	1600	1.2	86.0	3	Y	1600	2.0				N				
												2	89.0	M	3	Y	1800	1.2													
												4	88.0	M	3	Y	1600	1.2													

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	VEHICLE DESCRIPTION								WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
					SPARK ADVANCE																				OCT NO						
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	TECH R	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	RES	MOT	INIT	TECH R	GEAR	RPM	MV
23-25	NAR T25A3	B	N	9.0	Y	+ 8	+ 8	10404	61	28.33	48	3	92.0	M	3	Y	1800	1.8	F								B	M	3	1900	1.8
												2	94.0	M	3	Y	1800	1.8													
												4	88.0	M	3	Y	1800	1.8													
65-08	NAR T25A3	F	N	9.0	N	+ 8	+ 8	11418	71	29.47	82	3	95.5	M	3	Y	2100	2.5	F								A	M	3	1900	2.5
												2	96.5	M	3	Y	2100	2.5													
												4	92.0	M	3	Y	2100	2.5													
47-25	NAR T25A3	C	N	9.0	Y	+ 8	+ 8	27600	70	30.12	50	3	101.0	M	3	Y	1450	0.5	101.0	3	Y	1250	7.0								
												2	102.0	M	3	Y	1700	0.5													
												4	93.0	M	3	Y	1850	0.5													
47-28	NAR T25A3	C	N	9.0	Y	+ 8	+ 8	27300	70	30.12	50	3	99.0	M	3	Y	1300	1.4	99.0	3	Y	1350	7.0								
												2	101.0	M	3	Y	1500	1.4													
												4	90.0	M	3	Y	1800	1.4													
28-45	NAR T25A3	F	N	9.0	Y	+ 8	+ 8	19829	70	29.45	50	3	98.0	M	3	Y	1600	0.7	96.0	3	Y	1600	3.5				A	M	3	1600	1.0
												2	100.0	M	3	Y	1600	0.7													
												4	94.0	M	3	Y	1600	0.7													
62-02	NAR T25A3	F	N	9.0	Y	+ 8	+ 8	9812	68	30.38	48	3	94.0	P	3	N	1800	5.0	94.0	3	N	1800	5.0	0	93.3	82.5	A	P	3	2000	5.0
												2	97.0	P	3	N	1800	5.0													
												4	94.0	M	3	N	2800	1.1													
41-10	NAW P28A4	C	N	8.5	Y	+ 9	+ 9	8475	65	29.98	52	3	85.0	M	4	Y	1600	1.2	F						92.9	83.7	N				
												2	86.0	M	4	Y	1600	1.2													
												4	84.0	M	4	Y	1600	1.2													
08-05	NAX 228A3	F	N	8.0	Y	+10	+10	7978	77	29.66	50	3	86.0	M	3	Y	1700	3.0	84.0	3	Y	1600	6.0				N				
												2	88.0	M	3	Y	1550	3.0													
												4	84.0	M	3	Y	1550	3.0													
41-23	NAX 228A4	F	N	8.0	Y	+10	+10	16169	68	29.96	54	3	90.0	M	4	Y	1700	1.8	F						93.8	83.7	N				
												2	91.0	M	4	Y	1700	1.8													
												4	89.0	M	4	Y	1700	1.8													
07-10	NAX 228A4	F	N	8.0	Y	+10	+10	7273	68	30.26	48	3	90.0	M	4	Y	1650	1.5	88.0	4	Y	1650	2.5	N	93.1	82.0	B	M	4	1700	1.5
												2	92.0	M	4	Y	1600	1.5													
												4	88.0	M	4	Y	1600	1.5													
08-16	NBH 450A4	F	Y H	9.5	Y	0	0	7486	82	29.96	96	3	87.0	M	3	N	1650	1.5	86.0	4	Y	850	8.0				N				
												2	88.0	M	3	N	1650	1.5													
												4	80.0	M	4	Y	925	2.0													
08-17	NBH 450A4	F	Y L	9.5	Y	0	0	7486	82	29.96	96	3	86.0	M	3	N	1650	1.5													
												2	86.0	M	3	N	1650	1.5													
												4	84.0	M	4	Y	950	2.0													

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OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	MAXIMUM OCT NO	MAXIMUM THR	MAXIMUM GEAR	MAXIMUM CONV	MAXIMUM RPM	MAXIMUM MV	PART THROTTLE OCT NO	PART THROTTLE GEAR	PART THROTTLE CONV	PART THROTTLE RPM	PART THROTTLE MV	OWKNK	OCT NO RES	OCT NO MOT	RATER NINT	RATER THR	RATER GEAR	RATER RPM	RATER MV
05-08	NBH 450A4	F	Y H	9.5	Y	0	0	6033	67	30.26	68	3	93.0	M	2	N	1675	1.0	F												
												2	94.0	M	2	N	1675	1.0													
												4	90.0	M	2	N	2675	1.0													
05-09	NBH 450A4	F	Y L	9.5	Y	0	0	6033	67	30.26	68	3	92.0	M	2	N	1700	1.0													
												2	93.0	M	2	N	1700	1.0													
												4	90.0	M	2	N	2675	1.0													
23-02	NBH 450A4	F	Y H	9.5	Y	0	0	6560	75	28.88	72	3	95.0	M	4	Y	1100	1.0	90.0	4	Y	1100	2.0				B	M	4	1100	1.0
												2	96.0	M	4	Y	1100	1.0													
												4	93.0	M	4	Y	1100	1.0													
23-03	NBH 450A4	F	Y L	9.5	Y	0	0	6560	75	28.88	72	3	90.0	M	4	Y	1100	1.0													
												2	91.0	M	4	Y	1100	1.0													
												4	90.0	M	2	N	1800	0.8													
08-31	NBY 450A4	F	Y H	8.0	Y	+20	+20	11175	70	30.08	37	3	87.0	M	3	N	2050	1.5	86.0	3	N	1850	6.0				N				
												2	88.0	M	3	N	2050	1.5													
												4	84.0	M	3	N	2000	1.5													
08-32	NBY 450A4	F	Y L	8.0	Y	+20	+20	11175	70	30.08	37	3	84.0	M	3	N	2050	1.5													
												2	94.0	M	3	N	2000	1.5													
												4	80.0	M	3	N	1950	1.5													
28-28	NBZ T43A3	F	Y H	9.3	Y	0	0	10319	70	29.60	50	3	90.0	M	2	N	1900	0.5	F								B	M	2	2000	0.5
												2	91.0	M	2	N	1850	0.5													
												4	89.0	M	2	N	1900	0.5													
28-29	NBZ T43A3	F	Y L	9.3	Y	0	0	10319	70	29.60	50	3	90.0	M	2	N	1900	0.5	F												
												2	90.0	M	2	N	1900	0.5													
												4	89.0	M	2	N	1900	0.5													
28-38	NBZ T43A3	F	Y H	9.3	Y	0	0	10908	70	29.15	50	3	90.0	M	2	N	1800	0.5	F								B	M	3	2050	0.5
												2	92.0	M	2	N	1800	0.5													
												4	89.0	M	2	N	1900	0.5													
28-39	NBZ T43A3	F	Y L	9.3	Y	0	0	10908	70	29.15	50	3	89.0	M	2	N	2000	0.5	F												
												2	91.0	M	2	N	1800	0.5													
												4	89.0	M	2	N	1900	0.5													
28-40	NBZ T43A3	F	Y H	9.3	Y	0	0	10698	70	29.49	50	3	89.0	M	3	N	1900	0.7	F								N				
												2	90.0	M	2	N	2100	0.5													
												4	89.0	M	3	N	1900	0.7													
28-41	NBZ T43A3	F	Y L	9.3	Y	0	0	10698	70	29.49	50	3	89.0	M	3	N	1900	0.7	F												
												2	90.0	M	2	N	2100	0.5													
												4	89.0	M	3	N	1900	0.7													

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	VEHICLE DESCRIPTION								WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE						OCT NO		RATER				
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWNKNK	RES	MOT	NINT	THR	GEAR	RPM	MV
65-27	NBZ T43A4	F	Y H	9.3	Y	0	0	19892	69	29.55	72	3	96.0	M	3	N	2100	0.0	F								N				
												2	96.0	M	3	N	1850	0.0													
												4	95.5	M	2	N	2200	0.0													
65-28	NBZ T43A4	F	Y L	9.3	Y	0	0	19892	69	29.55	72	3	95.0	M	3	N	1900	0.0	F												
												2	94.0	M	3	N	1900	0.0													
												4	95.5	M	2	N	2200	0.0													
28-34	NFF P50A4	F	Y H	9.5	Y	+ 6	+ 6	26763	70	29.36	50	3	92.0	M	2	N	2400	0.5	90.0	3	N	1050	2.5				B	M	2	2200	0.5
												2	93.0	M	2	N	2600	0.5													
												4	91.0	M	2	N	2500	0.5													
28-35	NFF P50A4	F	Y L	9.5	Y	+ 6	+ 6	26763	70	29.36	50	3	90.0	M	2	N	2400	0.5	89.0	3	N	1100	2.5								
												2	93.0	M	2	N	2600	0.5													
												4	90.0	M	2	N	2500	0.5													
28-36	NFF P50A4	F	Y H	9.5	Y	+ 6	+ 6	29293	70	29.34	50	3	96.0	M	2	N	2400	0.5	F								A	M	2	2500	0.5
												2	96.0	M	2	N	2500	0.5													
												4	94.0	M	2	N	2500	0.5													
28-37	NFF P50A4	F	Y L	9.5	Y	+ 6	+ 6	29293	70	29.34	50	3	95.0	M	2	N	2400	0.5	F												
												2	96.0	M	2	N	2400	0.5													
												4	94.0	M	2	N	2500	0.5													
29-03	NFH 450A4	F	N	9.5	Y	0	0	13605	70	30.10	58	3	95.0	P	4	Y	1150	2.9						Y			A	M	4	1200	1.6
												2	95.5	M	4	Y	1200	1.6													
												4	94.5	M	4	Y	1300	1.6													
29-06	NFS P28A4	F	N	8.9	Y	+10	+10	11388	70	30.01	60	3	85.5	M	3	N	2500	1.0	85.0	4	Y	1700	3.0	N			N				
												2	85.5	M	2	N	4000	0.8													
												4	82.5	M	2	N	3000	0.8													
29-19	NFS P28A4	F	N	8.9	Y	+10	+10	16070	70	30.12	62	3	92.5	P	4	Y	1400	4.0									B	P	4	1450	4.0
												2	95.5	M	4	Y	1400	1.0													
												4	91.5	P	4	Y	1400	4.0													
65-20	NFS P28A4	F	N	8.9	Y	+10	+10	11663	65	29.74	66	3	86.0	M	4	Y	1800	1.0	F								N				
												2	86.0	M	2	N	2800	0.0													
												4	85.5	M	4	Y	1700	1.0													
47-20	NFS P28A4	C	N	8.9	Y	+10	+10	18000	70	30.00	50	3	90.0	M	4	Y	1700	0.5	87.0	4	Y	1800	1.5								
												2	90.0	M	2	N	3600	0.5													
												4	87.0	M	2	N	3400	0.5													
07-21	NFS P28A4	F	N	8.9	Y	+ 9	+10	17380	72	30.20	50	3	88.0	M	3	N	2500	0.6						N	94.1	83.2	B	M	3	3100	0.5
												2	88.0	M	3	N	2500	0.6													
												4	87.0	M	3	N	2500	0.6													

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OBS NO	MODEL CODE		EMCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	MAXIMUM OCT NO	THR	GEAR	CONV	RPM	MV	PART THROTTLE OCT NO	GEAR	CONV	RPM	MV	OWN KNK	OCT NO RES	OCT NO MOT	RATER NINT	THR	GEAR	RPM	MV
26-08	NFS	P28A4	F	N	8.9	Y	+10	+10	10158	84	29.99	77	3	78.0	M	4	Y	1400	0.5	L						92.0		N				
													2	80.0	M	4	Y	1350	0.5													
													4	76.0	M	4	Y	1500	0.5													
23-34	NFS	P28M5	F	N	8.9	Y	+ 8	+10	8014	72	29.06	76	3	86.0	M	4	N	1100	0.1	86.0	4	N	1100	1.0				N				
													2	86.0	M	4	N	1100	0.1													
													4	84.0	M	4	N	1100	0.1													
23-42	NGH	450A4	F	Y H	9.5	Y	0	0	6390	44	29.30	32	3	92.0	M	2	N	2600	0.8	91.0	4	Y	1300	4.0				B	M	3	2000	1.6
													2	93.0	M	2	N	2600	0.8													
													4	91.0	M	4	Y	1100	1.0													
23-43	NGH	450A4	F	Y L	9.5	Y	0	0	6390	44	29.30	32	3	89.0	M	4	Y	1100	1.0													
													2	89.0	M	4	Y	1100	1.0													
													4	89.0	M	2	N	1900	0.8													
23-36	NGZ	T43A3	F	Y H	9.3	Y	+ 2	0	8017	48	29.15	18	3	93.0	M	3	N	1900	0.8	F								B	M	3	1900	0.8
													2	94.0	M	3	N	1900	0.8													
													4	92.0	M	3	N	1900	0.8													
23-37	NGZ	T43A3	F	Y L	9.3	Y	+ 2	0	8017	48	29.15	18	3	89.0	M	3	N	1900	0.8													
													2	90.0	M	3	N	1900	0.8													
													4	89.0	M	3	N	1900	0.8													
41-04	NJP	T20A3	C	N	9.0	Y	+ 6	+ 6	7996	65	30.00	56	3	85.0	M	2	N	3200	1.0	F						93.2	83.7	N				
													2	86.0	M	2	N	3200	1.0													
													4	84.0	M	2	N	3200	1.0													
08-13	NJP	T20A3	F	N	9.0	Y	+ 6	+ 6	8346	80	29.90	89	3	82.0	M	2	N	3300	0.5	80.0	3	Y	1550	8.0				N				
													2	82.0	M	2	N	3600	0.5													
													4	78.0	M	2	N	3500	0.5													
08-37	NJP	T20A3	F	N	9.0	Y	+ 6	+ 6	11302	73	30.18	40	3	86.0	M	3	N	2850	1.5	82.0	3	Y	1750	5.5				N				
													2	87.0	M	3	Y	1850	3.0													
													4	84.0	M	3	N	2800	1.5													
23-35	NJP	T20A3	F	N	9.0	Y	+ 6	+ 6	7592	41	29.24	20	3	90.0	M	2	N	4000	0.8	87.0	3	Y	1600	4.0				N				
													2	93.0	M	2	N	4200	0.8													
													4	87.0	M	2	N	2900	0.8													
23-46	NJP	T20M4	F	N	9.0	Y	+ 6	+ 6	7258	50	29.97	30	3	85.0	M	4	N	1300	0.5	84.0	4	N	1300	0.5				N				
													2	85.0	M	4	N	1300	0.5													
													4	83.0	M	4	N	1300	0.5													
06-20	NJW	P28A3	F	N	8.5	Y	- 9	-10	10358	45	29.90	40	3	89.0	M	3	Y	1600	1.8	89.0	3	Y	1500	4.0	N	92.3	82.6	N				
													2	91.0	M	3	Y	1650	1.8													
													4	87.0	M	3	Y	1600	1.8													

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OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	MAXIMUM OCT NO	MAXIMUM THR	MAXIMUM GEAR	MAXIMUM CONV	MAXIMUM RPM	MAXIMUM MV	PART THROTTLE OCT NO	PART THROTTLE GEAR	PART THROTTLE CONV	PART THROTTLE RPM	PART THROTTLE MV	OWKNK	OCT NO RES	OCT NO MOT	RATER NINT	RATER THR	RATER GEAR	RATER RPM	RATER MV
23-45	NTC 216A3	F	N	9.0	Y	+ 8	+ 8	14080	60	29.28	36	3	92.0	M	3	N	2200	1.2	88.0	3	Y	1600	3.0				N				
												2	93.0	M	3	N	2200	1.2													
												4	90.0	M	3	N	2000	1.2													
26-10	NTC 216A3	F	N	9.0	Y	+ 8	+ 8	18569	82	29.93	143	3	89.0	M	2	N	2350	0.5	86.0	3	N	2100	1.5		92.0		8	M	3	2600	0.5
												2	90.0	M	3	N	2200	0.5													
												4	86.0	M	3	N	2200	0.5													
23-32	NY8 P57A4	F	Y H	9.5	Y	+ 6	+ 6	9121	71	28.98	68	3	95.0	M	4	Y	1000	1.2	94.0	4	Y	1100	2.0				8	M	4	1000	1.2
												2	96.0	M	4	Y	1000	1.2													
												4	94.0	M	4	Y	1000	1.2													
23-33	NY8 P57A4	F	Y L	9.5	Y	+ 6	+ 6	9121	71	28.98	68	3	90.0	M	2	N	3200	1.0													
												2	92.0	M	2	N	3200	1.0													
												4	88.0	M	4	Y	1000	1.0													
08-19	NUS4 216A3	F	N	9.0	Y	+ 8	+ 8	6236	81	29.68	88	3	94.0	M	2	N	2700	0.5	F								8	M	2	2900	0.5
												2	95.0	M	2	N	3800	0.5													
												4	90.0	M	3	N	2350	1.5													
08-33	NUS4 216A3	A	N	9.0	Y	+ 5	+ 5	12132	77	30.05	34	3	89.0	M	4	Y	2150	1.6	F								8	M	2	3500	0.5
												2	90.0	M	4	Y	2150	1.6													
												4	86.0	M	4	Y	2250	1.6													
28-16	NUS4 216A3	F	N	9.0	Y	+ 5	+ 5	10334	70	29.29	48	3	93.0	M	2	N	2200	2.0	F								8	M	2	2100	2.0
												2	94.0	M	2	N	2100	2.0													
												4	93.0	M	2	N	2300	1.5													
41-06	OE9 219A3	C	N	9.0	Y	+10	+10	9355	68	29.88	52	3	88.0	M	3	N	2100	1.4	F						93.0	83.6	N				
												2	88.0	M	3	N	2100	1.4													
												4	86.0	M	3	N	2100	1.4													
28-23	OE9 219A3	F	N	9.0	Y	+10	+10	14551	70	29.25	54	3	89.0	M	3	N	2100	0.5	87.0	3	N	1900	2.5								
												2	90.0	M	3	N	2100	0.5													
												4	87.0	M	3	N	2350	0.5													
32-03	OE9 219A3	F	N	9.0	Y	+10	+10	10117	86	29.49	67	3	86.0	M	3	N	1250	1.6	86.0	3	N	1250	2.0	N			N				
												2	86.0	M	3	N	1250	1.6													
												4	86.0	M	3	N	1250	1.6													
65-11	OE9 219A3	F	N	9.0	N	+10	+10	16391	67	29.72	49	3	92.0	M	3	N	1850	1.0	F								8	M	3	1700	1.0
												2	93.0	M	3	N	1650	1.0													
												4	93.0	M	3	N	1650	1.0													
26-22	OE9 219A3	F	N	9.0	Y	+10	+10	8221	62	30.01	54	3	85.5	M	3	N	1600	0.5	84.5	3	N	1400	1.5		93.2		N				
												2	86.0	M	3	N	1700	0.5													
												4	86.0	M	3	N	1400	0.5													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
					SPARK ADVANCE																										
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWNKNK	OCT NO RES	OCT NO MOT	MINTR	THR	GEAR	RPM	MV
41-28	OE9 219M4	C	N	9.0	N	+10	+10	14910	70	30.10	58	3	87.0	M	4	N	1900	0.4	F					N	93.3	83.8	N				
												2	88.5	M	4	N	1900	0.4													
												4	85.0	M	4	N	1900	0.4													
05-35	OE9 219M4	F	N	9.0	Y	+10	+10	13046	69	29.70	54	3	87.0	M	4	N	1750	0.1	F					O	92.5	83.0	B	M	4	1600	0.1
												2	87.5	M	4	N	1750	0.1													
												4	86.0	M	4	N	1750	0.1													
06-16	OE9 219M4	F	N	9.0	Y	-10	-10	11074	49	30.26	19	3	94.0	M	4	N	1100	0.7	94.0	4	N	1200	2.0	N	98.5	87.0	B	M	3	900	0.7
												2	95.5	M	4	N	1400	0.7													
												4	93.0	M	4	N	1000	0.7													
32-06	OE9 219M5	F	N	9.0	Y	+10	+10	10195	86	29.32	67	3	85.0	M	4	N	1900	0.3	84.0	4	N	1800	2.0	N			N				
												2	86.0	M	4	N	2000	0.3													
												4	84.0	M	4	N	2000	0.3													
29-17	OEJ P19M5	F	N	9.0	Y	+10	+10	6664	70	30.10	60	3	93.5	M	2	N	1450	0.9	93.0	4	N	1400	0.4	Y			A	M	2	1300	0.9
												2	94.5	M	2	N	1400	0.9													
												4	92.5	M	2	N	1300	0.9													
28-22	OEJ P19M5	F	N	9.0	Y	+10	+10	11602	70	29.43	59	3	93.0	P	4	N	1500	3.0									B	P	4	1500	3.0
												2	94.0	P	4	N	1500	3.0													
												4	90.0	M	4	N	1550	0.5													
32-10	OEJ P19M5	F	N	9.0	Y	+10	+10	9956	85	29.40	67	3	87.0	M	4	N	2500	0.5	87.0	4	N	2000	2.0	N			N				
												2	89.0	P	4	N	2000	2.0													
												4	88.0	M	4	N	2500	0.5													
28-21	OFA 123A3	F	N	9.5	Y	+10	+10	11760	70	29.64	50	3	89.0	M	3	N	2800	0.7	96.0	3	N	2600	2.0				N				
												2	90.0	M	3	N	2700	0.7													
												4	89.0	M	3	N	2800	0.7													
65-05	OFA 123A3	F	N	9.5	N	+10	+10	6310	73	29.54	95	3	93.5	M	3	N	2500	3.0	F								A	M	2	2900	2.0
												2	95.0	M	3	N	2500	3.0													
												4	92.0	M	3	N	2800	3.0													
28-44	OFA 123A3	F	N	9.5	Y	+10	+10	16755	70	29.25	50	3	94.0	M	3	N	2600	1.0	92.0	3	N	2700	2.0	N			A	M	3	2600	1.0
												2	95.0	M	3	N	2700	1.0													
												4	91.0	M	3	N	2500	1.0													
32-18	OFA 123M4	F	N	9.5	Y	+10	+10	22169	85	29.51	65	3	91.0	M	4	N	1650	0.2	91.0	4	N	1900	2.0	N			B	M	4	1500	0.2
												2	92.0	M	4	N	1700	0.2													
												4	91.0	M	4	N	1600	0.2													
28-01	OPF P50A4	F	N	8.9	Y	+10	+10	9792	70	29.22	50	3	85.0	M	4	N	1150	1.0	83.0	4	N	1200	2.0				N				
												2	86.0	M	4	N	1150	1.0													
												4	85.0	M	4	N	1150	1.0													

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	VEHICLE DESCRIPTION						SPARK ADVANCE			WEATHER			OCTANE NUMBER REQUIREMENT DATA	MAXIMUM					PART THROTTLE					TANK FUEL INFORMATION			RATER				
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	DWKNK	OCT NO RES	OCT NO MOT	MINT	THR	GEAR	RPM	MV
05-07	OPF P30A4	F	N	8.9	Y	+10	+10	8274	69	30.20	54	3	92.0	M	4	N	930	2.8	89.0	4	N	920	7.0				N				
												2	93.5	M	4	N	920	2.8													
												4	91.0	M	3	N	1650	1.0													
08-06	ORU P30A3	F	Y H	9.3	Y	+10	+10	6160	80	29.82	69	3	84.0	M	3	Y	1250	5.5	80.0	3	Y	1250	7.0				N				
												2	85.0	M	3	Y	1250	5.5													
												4	84.0	M	3	N	2150	2.5													
08-07	ORU P30A3	F	Y L	9.3	Y	+10	+10	6160	80	29.82	69	3	82.0	M	3	Y	1300	5.5													
												2	82.0	M	3	Y	1300	5.5													
												4	76.0	M	3	N	2150	2.5													
28-12	ORU P30A3	F	Y H	9.3	Y	+10	+10	11695	70	29.24	50	3	86.0	M	3	N	2200	1.5	F					N			N				
												2	88.0	M	3	N	2100	1.7													
												4	83.0	M	3	N	2300	0.5													
28-13	ORU P30A3	F	Y L	9.3	Y	+10	+10	12150	70	29.31	53	3	84.0	M	3	N	2400	0.5													
												2	87.0	M	3	N	2200	1.5													
												4	82.0	M	3	N	2300	0.5													
41-05	ORU P30A4	C	Y H	9.3	Y	+10	+10	10778	65	30.04	57	3	86.0	M	3	N	2400	0.8	F						93.2	83.2	N				
												2	87.0	M	3	N	2400	0.8													
												4	84.0	M	3	N	2400	0.8													
41-12	ORU P30A4	C	Y H	9.3	Y	+10	+10	7086	67	30.01	54	3	86.0	M	3	N	2450	0.8	F					N	93.1	82.7	N				
												2	86.0	M	3	N	2450	0.8													
												4	83.0	M	3	N	2450	0.8													
41-25	ORU P30A4	C	Y H	9.3	Y	+10	+10	13848	70	30.05	52	3	97.0	M	3	N	2400	0.8	F						93.2	83.6	8	M	3	2400	0.8
												2	97.0	M	3	N	2400	0.8													
												4	94.0	M	3	N	2400	0.8													
41-26	ORU P30A4	C	Y L	9.3	Y	+10	+10	13848	70	30.05	52	3	86.0	M	3	N	2400	0.8													
												2	86.0	M	3	N	2400	0.8													
												4	84.0	M	3	N	2400	0.8													
06-10	ORU P30A4	F	Y H	9.3	Y	+10	+10	6267	63	30.26	48	3	88.0	M	4	N	1400	0.4	88.0	4	N	1450	1.4								
												2	88.0	M	4	N	1500	0.4													
												4	88.0	M	4	N	1350	0.4													
06-11	ORU P30A4	F	Y L	9.3	Y	+10	+10	6267	63	30.26	48	3	87.0	M	4	N	1300	0.4	87.0	4	N	1400	1.4								
												2	87.0	M	4	N	1300	0.4													
												4	86.0	M	4	N	1300	0.4													
05-28	ORU P30A4	F	Y H	9.3	Y	+10	+10	8322	69	30.38	51	3	90.0	M	4	N	2150	1.4	86.0	4	N	1400	5.0								
												2	91.0	M	4	N	2200	1.5													
												4	90.0	M	4	N	2200	1.4													

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	VEHICLE DESCRIPTION								WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																			OCT NO						
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	RES	MOT	NINT	THR	GEAR	RPM	MV
05-29	ORU P30A4	F	Y L	9.3	Y	+10	+10	8322	69	30.38	51	3	90.0	M	4	N	2150	1.4													
												2	91.0	M	4	N	2200	1.5													
												4	90.0	M	4	N	2200	1.4													
47-27	ORU P30A4	F	Y H	9.3	Y	+10	+10	16300	70	30.12	50	3	91.0	M	3	N	2700	0.5	F												
												2	93.0	M	2	N	3750	0.5													
												4	88.0	M	3	N	2600	0.5													
26-02	ORU P30A4	F	Y H	9.3	Y	+10	+10	7514	97	29.88	102	3	82.0	M	4	Y	1350	0.5	80.0	4	Y	1350	1.5		93.9		N				
												2	82.0	M	4	Y	1250	0.5													
												4	80.0	M	4	Y	1350	0.5													
26-03	ORU P30A4	F	Y L	9.3	Y	+10	+10	7514	97	29.88	102	3	82.0	M	4	Y	1350	0.5													
												2	82.0	M	4	Y	1250	0.5													
												4	78.0	M	4	Y	1350	0.5													
26-32	ORU P30A4	F	Y H	9.3	Y	+10	+10	6623	70	29.90	53	3	88.0	M	3	Y	1700	0.7	87.0	4	Y	1600	1.5		98.6		N				
												2	91.0	M	2	N	3050	0.5													
												4	87.0	M	2	N	2400	0.5													
26-33	ORU P30A4	F	Y L	9.3	Y	+10	+10	6623	70	29.90	53	3	87.0	M	3	N	2400	0.7													
												2	88.0	M	2	N	2950	0.5													
												4	86.0	M	3	N	2300	0.7													
08-30	OS3 T38A3	F	N	8.7	Y	+10	+10	10513	70	29.27	95	3	87.0	M	2	N	2150	0.5	84.0	3	N	1550	5.5				N				
												2	88.0	M	2	N	2300	0.5													
												4	86.0	M	2	N	2250	0.5													
07-08	OS3 T38A3	F	N	8.7	Y	+10	+10	19647	72	30.20	57	3	88.0	M	2	N	2100	0.6	F					N	95.4	84.9	B	M	2	1950	0.6
												2	89.0	M	2	N	2100	0.6													
												4	86.0	M	2	N	1950	0.6													
32-24	OSF P50A4	F	N	8.9	Y	+12	+12	9073	85	29.28	65	3	87.0	M	4	N	1150	1.0	87.0	4	N	1100	3.0	N			N				
												2	87.0	M	4	N	1100	1.0													
												4	87.0	M	4	N	1200	1.0													
32-28	OSF P50A4	F	N	8.9	Y	+10	+10	13179	85	29.54	63	3	90.0	M	4	N	1000	2.5	89.0	4	N	1100	4.0	N			B	M	4	1250	2.5
												2	90.0	M	4	N	1000	2.5													
												4	90.0	M	4	N	1000	2.5													
32-33	OTS T23M5	F	N	9.0	Y	+10	+10	16353	85	29.64	64	3	89.0	M	4	N	1700	0.2	88.0	4	N	1700	2.0	N			N				
												2	88.0	M	4	N	1800	0.2													
												4	88.0	M	4	N	1700	0.2													
47-26	OTX T23A3	C	N	9.0	Y	+10	+10	19630	70	29.96	50	3	91.0	M	3	N	1600	0.8	89.0	3	N	1750	2.0								
												2	92.0	M	2	N	2750	0.6													
												4	91.0	M	3	N	1400	0.8													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWNK	OCT NO RES	OCT NO MOT	NITR	THR	GEAR	RPM	MV
47-31	OTX T23A3	C	N	9.0	Y	+10	+10	27800	70	30.12	50	3	91.0	M	3	N	1900	0.5	90.0	3	N	1800	1.5								
												2	94.0	M	3	N	2900	0.5													
												4	90.0	M	3	N	1700	0.5													
26-14	OTX T23A3	F	N	9.0	Y	+10	+10	9201	70	28.79	52	3	90.0	M	3	N	1200	1.5	88.0	3	N	1200	4.0		92.6		N				
												2	90.0	M	3	N	1300	1.5													
												4	90.0	M	3	N	1250	1.5													
08-11	PEK T25A3	A	N	9.0	Y	+12	+12	15671	75	29.82	37	3	88.0	M	3	N	2000	2.5	87.0	3	N	1750	5.0				N				
												2	89.0	M	3	N	1850	2.5													
												4	86.0	M	3	N	1800	2.5													
05-06	PEK T25A3	F	N	9.0	Y	+12	+12	9239	68	30.28	50	3	87.0	M	3	N	2850	1.6	F								N				
												2	89.0	M	3	N	2900	1.6													
												4	83.0	M	3	N	2875	1.6													
40-06	PEK T25A3	F	N	9.0	Y	+12	+12	10714	63	29.89	69	3	87.0	M	3	N	2900	1.0	85.5	3	N	2000	3.0		92.0	84.0	N				
												2	86.5	M	3	N	2500	1.0													
												4	87.0	M	3	N	2500	1.0													
08-01	PKD T22A3	A	N	9.5	Y	+12	+12	6455	75	29.68	37	3	84.0	M	2	N	2800	1.0	84.0	3	N	1950	2.0				N				
												2	86.0	M	3	N	2000	1.0													
												4	83.0	M	2	N	2900	1.0													
06-07	PKD T22A3	F	N	9.5	Y	+ 9	+12	6348	68	30.04	56	3	90.0	M	3	N	2200	0.4	89.0	3	N	2200	1.5								
												2	90.0	M	3	N	2200	0.4													
												4	90.0	M	3	N	2200	0.4													
47-21	PKD T22A3	F	N	9.5	Y	[illegible]	+12	8400	70	30.03	50	3	88.0	M	3	N	2000	0.5	86.0	3	N	2000	1.5								
												2	88.0	M	3	N	2100	0.5													
												4	87.0	M	3	N	2700	0.5													
26-11	PKD T22A3	F	N	9.5	Y	+12	+12	6624	91	29.86	124	3	88.0	M	2	N	1850	0.3	86.0	3	N	1750	1.3		92.6		N				
												2	88.0	M	2	N	1850	0.3													
												4	87.0	M	2	N	1800	0.3													
41-13	PKK T25A3	C	N	9.0	Y	+12	+12	6532	65	30.32	53	3	91.0	M	2	N	2750	1.4	F						93.0	83.8	N				
												2	91.0	M	2	N	2750	1.4													
												4	90.0	M	2	N	2750	1.4													
08-35	PKK T25A3	A	N	9.0	Y	+12	+12	13609	78	30.04	44	3	84.0	M	2	N	2900	0.8	F								N				
												2	[illegible]	[illegible]	2	N	3000	0.8													
												4	82.0	M	2	N	3000	0.8													
08-21	PLC 222A3	A	N	9.0	Y	+10	+10	22045	75	30.06	67	3	89.0	M	2	N	3000	0.5	F								B	M	2	2900	0.5
												2	92.0	M	2	N	3000	0.5													
												4	87.0	M	2	N	2800	0.5													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	TECH R	GEAR	CHAN V	RPM	MV	OCT NO	GEAR	CHAN V	RPM	MV	O#KNK	OCT NO RES	OCT NO MOT	NINT	TECH R	GEAR	RPM	MV
05-13	PLC 222A3	F	N	9.0	Y	+ 8	+ 8	16548	68	30.50	30	3	96.0	P	3		2300	7.0													
												2	99.5	P	3		2300	7.0													
												4	90.0	M	2		2700	1.5													
06-08	RBD T14M4	F	N	9.0	Y			13152	79	30.43	113	3	90.0	M	3	N	3600	1.0	89.5	4	N	1900	1.4	N	91.8	82.4	N				
												2	93.0	M	3	N	3500	1.0													
												4	88.0	M	4	N	1500	0.4													
62-08	ETS 224M5	F	N	8.3	N	+ 3	+ 3	30984	72	29.87	54	3	91.0	P	4	N	2200	9.0	91.0	4	N	2200	9.0	N	93.2	82.6	N				
												2	95.0	P	4	N	2200	9.0													
												4	85.0	P	4	N	2300	9.0													
23-30	NTLH 450A3	F	Y H	9.2	Y	+ 4	+ 4	8901	60	29.76	34	3	90.0	M	3	N	2000	1.0	90.0	3	Y	1500	4.0				N				
												2	92.0	M	3	N	2000	1.0													
												4	89.0	M	3	N	1900	1.0													
23-31	NTLH 450A3	F	Y L	9.2	Y	+ 4	+ 4	8901	60	29.76	34	3	87.0	M	3	N	1900	1.0													
												2	88.0	M	3	N	1900	1.0													
												4	86.0	M	3	N	1900	1.0													
23-40	NTLH 450A3	F	Y H	9.2	Y	+ 4	+ 4	6019	40	29.93	29	3	90.0	M	2	N	2300	0.8	90.0	3	Y	1400	3.0				N				
												2	91.0	M	2	N	2300	0.3													
												4	89.0	M	2	N	2200	0.3													
23-41	NTLH 450A3	F	Y L	9.2	Y	+ 4	+ 4	6019	40	29.93	29	3	87.0	M	2	N	2400	0.8													
												2	87.0	M	2	N	2400	0.8													
												4	86.0	M	2	N	2400	0.8													
07-22	NTLH 450A3	F	Y H	9.2	Y	+ 4	+ 4	6202	74	30.38	60	3	88.0	M	2	N	2300	1.3	84.0	3	Y	2050	7.5	N	92.1	82.4	N				
												2	87.0	M	3	N	2300	1.7													
												4	87.0	M	2	N	2300	1.3													
07-23	NTLH 450A3	F	Y L	9.2	Y	+ 4	+ 4	6202	74	30.38	60	3	87.0	M	2	N	2200	1.3	F												
												2	87.0	M	2	N	2500	1.3													
												4	87.0	M	2	N	2300	1.3													
23-13	NTLH 450A4	F	Y H	9.2	Y	+ 5	+ 4	6664	66	29.23	44	3	93.0	M	2	N	3300	0.6	93.0	4	Y	1200	2.0				N				
												2	94.0	M	2	N	3400	0.6													
												4	90.0	M	4	Y	1200	1.0													
23-14	NTLH 450A4	F	Y L	9.2	Y	+ 5	+ 4	6664	66	29.23	44	3	92.0	M	4	Y	1300	1.0													
												2	93.0	M	2	Y	3200	0.6													
												4	89.0	M	4	Y	1200	1.0													
46-04	NTLH 450A4	F	Y H	9.2	Y	+ 4	+ 4	6183	83	29.30	124	3	81.0	M	3	Y	1875	2.0	80.0	3	Y	1825	3.0	N	91.3	82.9	N				
												2	83.0	M	3	Y	1750	2.0													
												4	80.0	M	3	Y	1950	2.0													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																									
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	NINT	THR	GEAR	RPM	MV
46-05	NTLH 450A4	F	Y L	9.2	Y	+ 4	+ 4	6183	83	29.30	124	3	L						L												
												2	L																		
												4	L																		
07-01	NTLH 450A4	F	Y H	9.2	Y	+ 4	+ 4	14850	72	29.98	54	3	88.0	M	4	Y	1200	1.2	88.0	4	Y	1200	3.0	N	97.7	85.6	N				
												2	88.0	M	4	Y	1300	1.2													
												4	86.0	M	4	Y	1300	1.2													
07-02	NTLH 450A4	F	Y L	9.2	Y	+ 4	+ 4	14850	72	29.98	54	3	86.0	M	4	Y	1300	1.2	85.0	4	Y	1350	3.0								
												2	86.0	M	4	Y	1400	1.2													
												4	84.0	M	4	Y	1300	1.2													
62-03	NTLN 443A3	F	Y H	9.3	N	0	0	6037	70	29.83	52	3	88.0	M	2	N	2500	0.5	85.0	3	N	1600	0.5	N	94.7	83.9	N				
												2	90.0	M	2	N	2500	0.5													
												4	84.0	M	2	N	2500	0.5													
62-04	NTLN 443A3	F	Y L	9.2	N	0	0	6037	70	29.83	52	3	87.0	M	2	N	2200	0.5	85.0	3	N	1750	5.0								
												2	88.0	M	3	Y	1650	1.5													
												4	84.0	M	2	N	2450	0.5													
60-08	NTLN 443A3	F	Y H	9.3	Y	0	0	6205	69	30.22	62	3	95.0	M	2	N	1900	0.5	F					N	97.7	85.4	N				
												2	87.0	M	2	N	1900	0.5													
												4	87.0	M	3	N	2000	0.5													
60-09	NTLN 443A3	F	Y L	9.3	Y	0	0	6205	69	30.22	62	3	84.0	M	3	N	2000	0.5													
												2	86.0	M	3	N	1900	1.2													
												4	86.0	M	3	N	2000	1.2													
46-07	NTLN 443A3	F	Y H	9.3	Y	0	0	6977	86	29.30	138	3	87.0	M	3	N	2150	1.5	F					N	92.1	83.2	N				
												2	87.0	M	3	N	2150	1.5													
												4	88.0	M	3	N	2175	1.5													
05-25	NTLN 443M4	F	Y H	9.3	N	0	0	10088	68	30.39	59	3	87.0	M	4	N	1450	0.8	F					N	93.4	83.6	N				
												2	89.0	M	4	N	1450	0.8													
												4	84.0	M	4	N	1425	0.8													
05-26	NTLN 443M4	F	Y L	9.3	N	0	0	10088	68	30.39	59	3	85.0	M	4	N	1500	0.8													
												2	86.0	M	4	N	1500	0.8													
												4	81.0	M	4	N	1425	0.8													
23-44	NTSE T25M5	B	N	9.0	Y	+ 8	+ 8	28213	48	29.49	29	3	85.0	M	4	N	3000	1.5	84.0	4	N	3000	3.0				N				
												2	86.0	M	4	N	3000	1.5													
												4	83.0	M	4	N	2600	1.5													
06-14	NTSR T28A4	F	Y H	8.9	Y	+10	+10	6145	72	30.18	86	3	90.0	M	4	Y	1500	1.0	90.0	4	Y	1800	2.5								
												2	91.0	P	4	Y	1600	2.5													
												4	90.0	M	4	Y	1600	1.0													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	MINT	THR	GEAR	RPM	MV
26-21	OTLN 458A3	F	Y H	8.3	Y	+10	+10	20026	68	30.00	44	3	98.0	M	3	N	2400	1.0	F						96.0		M				
												2	89.0	M	3	N	2450	1.0													
												4	86.0	M	3	N	2400	1.0													
05-37	OTLN	P50A4	F	Y H	9.0	Y	+10	+10	6580	70	30.03	52	3	89.0	M	4	N	1175	2.2	F					N	93.5	83.1	A	M	4	1300	2.0
												2	90.0	M	4	N	1200	2.4													
												4	88.0	M	4	N	1150	2.0													
05-38	OTLN P50A4	F	Y L	9.0	Y	+10	+10	6580	70	30.03	52	3	89.0	M	4	N	1175	2.2													
												2	89.0	M	4	N	1225	2.4													
												4	88.0	M	4	N	1150	2.0													
32-16	OTLN P50A4	F	Y H	9.0	Y	+10	+10	7815	85	29.50	63	3	87.0	M	2	N	2400	0.8	94.0	4	N	1300	2.0	N			9	M	2	2900	0.9
												2	88.0	M	2	N	2400	0.8													
												4	88.0	M	2	N	2400	0.8													
32-17	OTLN P50A4	F	Y L	9.0	Y	+10	+10	7815	85	29.50	63	3	85.0	M	2	N	2400	0.8													
												2	85.0	M	2	N	2400	0.8													
												4	85.0	M	2	N	2400	0.8													
46-12	OTLN P50A4	F	Y H	9.0	Y	+10	+10	8362	85	29.28	108	3	87.0	M	4	N	1400	2.0	87.0	4	N	1400	3.0	N	90.3	83.6	M				
												2	87.0	M	4	N	1400	2.0													
												4	87.0	M	4	N	1450	2.0													
46-13	OTLN P50A4	F	Y L	9.0	Y	+10	+10	8362	85	29.28	108	3	87.0	M	4	N	1400	2.0	86.0	4	N	1450	3.0								
												2	87.0	M	4	N	1400	2.0													
												4	84.0	M	4	N	1450	2.0													
26-23	OTLN P50A4	F	Y H	9.0	Y	+10	+10	8340	71	30.12	45	3	85.5	M	4	Y	1200	0.4	82.0	4	Y	1100	1.5		91.8		M				
												2	85.5	M	4	Y	1300	0.4													
												4	85.5	M	3	N	1400	0.5													
26-24	OTLX P50A4	F	Y L	9.0	Y	+10	+10	8340	71	30.12	45	3	85.5	M	4	Y	1200	0.4													
												2	85.5	M	4	Y	1300	0.4													
												4	85.5	M	3	N	1400	0.5													
26-38	OTLN P50A4	F	Y H	9.0	Y	+10	+10	18460	68	30.23	51	3	90.0	M	2	N	2200	1.0	88.0	4	Y	1300	2.5	Y	92.2		B	M	4	1250	1.5
												2	93.0	M	2	N	3000	1.0													
												4	90.0	M	2	N	2350	1.0													
26-39	OTLN P50A4	F	Y L	9.0	Y	+10	+10	18460	68	30.23	51	3	90.0	M	2	N	2200	1.0						Y							
												2	92.0	M	2	N	3550	1.0													
												4	89.0	M	2	N	2300	1.0													
26-20	OTLY 149A3	F	N	8.5	Y	+10	+10	19043	70	30.03	52	3	L						L						93.0		M				
												2	80.0	M	3	N	2000	1.5													
												4	76.0	M	3	N	1850	1.5													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																			OCT NO						
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CHANV	RPM	MV	OCT NO	GEAR	CHANV	RPM	MV	ONKNK	RES	MOT	NIT	THR	GEAR	RPM	MV
07-33	OTLY 149M4	F	N	8.5	N	+10	+10	8793	69	30.26	46	3	93.0	M	3	N	2100	0.5	91.0	4	N	1600	8.0	N	92.1	82.4	A	M	3	2400	0.5
												2	95.0	M	3	N	2200	0.5													
												4	92.0	M	3	N	2200	0.5													
41-11	OTSA T23M5	C	Y H	9.5	N	+10	+10	7896	64	30.04	56	3	91.0	M	4	N	2200	0.3	89.0	4	N	2200	1.3	N	93.2	83.4	B	M	4	2200	0.3
												2	92.0	M	4	N	2200	0.3													
												4	90.0	M	4	N	2200	0.3													
46-10	OTSA T23M5	F	Y H	9.5	Y	+10	+10	10887	71	29.41	74	3	95.0	P	3	N	3000	2.0	95.0	3	N	3000	2.0	N			B	P	4	1575	2.0
												2	97.0	P	3	N	3000	2.0													
												4	90.0	P	3	N	2900	2.0													
46-11	OTSA T23M5	F	Y L	9.5	Y	+10	+10	10887	71	29.41	74	3	92.0	P	3	N	2750	2.0	92.0	3	N	2750	2.0								
												2	94.0	P	3	N	3000	2.0													
												4	89.0	P	3	N	2650	2.0													
32-25	OTST P29M5	F	Y H	9.3	Y	+12	+12	20500	86	29.28	64	3	87.0	M	4	N	1500	0.2	84.0	4	N	1600	2.0	N			N				
												2	85.0	M	4	N	1600	0.2													
												4	85.0	M	4	N	1500	0.2													
32-26	OTST P29M5	F	Y L	9.3	Y	+12	+12	20500	86	29.28	64	3	85.0	M	4	N	1600	0.2													
												2	85.0	M	4	N	1600	0.2													
												4	84.0	M	4	N	1500	0.2													
07-32	NUSE T25A4	F	N	9.0	Y	+ 8	+ 8	9045	68	30.30	44	3	92.0	M	3	N	3100	1.5	91.0	4	Y	2000	3.0	N	93.6	83.3	B	M	3	3400	1.2
												2	94.0	P	4	Y	2150	8.0													
												4	90.0	M	3	N	3100	1.5													
65-38	NUSR T28A4	F	Y H	8.9	Y	+10	+10	10849	55	29.62	55	3	93.0	P	4	Y	1800	1.5	93.0	4	Y	1800	1.5				N				
												2	94.0	P	4	Y	1800	1.5													
												4	93.5	M	4	Y	1800	0.0													
65-39	NUSR T28A4	F	Y L	8.9	Y	+10	+10	10849	55	29.62	55	3	93.0	P	4	Y	1800	1.5	93.0	4	Y	1800	1.5								
												2	93.0	P	4	Y	1800	1.5													
												4	93.5	M	4	Y	1800	0.0													
28-05	KVMT 252A3	F	N	9.1	Y	+12	+12	10540	70	29.45	50	3	90.0	M	3	N	1600	4.0	88.0	3	N	2000	2.5				N				
												2	90.0	M	3	N	1600	4.0													
												4	89.0	M	3	N	1600	4.0													
05-20	KVMT 252A3	F	N	9.1	Y	+12	+12	9059	68	30.02	56	3	100.0	P	3	Y	2100	10.0						N	97.3	87.5	A	P	3	2100	10.0
												2	101.5	P	3	Y	2050	10.0													
												4	98.0	P	3	Y	2075	10.0													
07-17	KVSC 222M5	F	N	9.5	Y	+ 5	+ 6	7106	68	30.55	48	3	89.0	M	4	N	3300	0.6	97.0	4	N	1900	4.0	N	92.0	82.3	B	M	4	1900	0.0
												2	92.0	M	4	N	3200	0.6													
												4	89.0	M	4	N	3250	0.6													

1986 CRC OCTANE NUMBER REQUIREMENT SURVEY

VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	TECHR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	MINT	TECHR	GEAR	RPM	MV
06-15	KVSG 226A3	F	N	8.7	Y	+ 7	+ 7	9792	61	30.11	55	3	99.0	M	3	N	1600	3.0	97.0	3	N	1600	4.0	N			A	M	3	2000	3.0
												2	100.0	P	3	N	1800	4.0													
												4	92.0	M	3	N	1600	3.0													
25-26	KVSG 226A3	F	N	8.7	Y	+ 7	+ 7	10170	70	29.90	53	3	93.0	M	2	N	2000	2.0	90.0	3	N	1950	4.0	Y	91.7		A	M	2	2000	2.0
												2	94.0	M	2	N	1950	2.0													
												4	90.0	M	2	N	1850	2.0													
26-27	KVSG 226A3	F	N	8.7	Y	+ 7	+ 7	16902	70	29.84	53	3	92.0	M	2	N	1950	2.0	86.0	3	N	1900	4.0	Y	91.3		N				
												2	93.0	M	2	N	1950	2.0													
												4	88.0	M	2	N	1900	2.0													
05-23	NVLH 450A3	F	Y H	9.2	N	+ 4	+ 4	15544	67	30.18	65	3	86.0	M	3	Y	1575	3.0	F												
												2	87.0	M	3	Y	1575	3.0													
												4	85.0	M	3	Y	1575	3.0													
05-24	NVLH 450A3	F	Y L	9.2	N	+ 4	+ 4	15544	67	30.18	65	3	85.0	M	3	Y	1575	3.0													
												2	86.0	M	3	Y	1575	3.0													
												4	84.0	M	3	Y	1600	3.0													
23-38	NVLH 450A3	F	Y H	9.2	Y	+ 4	+ 4	6102	46	29.38	22	3	91.0	M	3	Y	1400	2.4	91.0	3	Y	1400	3.5				N				
												2	92.0	M	2	N	3200	1.6													
												4	91.0	M	3	Y	1300	2.4													
23-39	NVLH 450A3	F	Y L	9.2	Y	+ 4	+ 4	6102	46	29.38	22	3	87.0	M	3	Y	1300	2.4													
												2	98.0	M	3	Y	1400	2.4													
												4	87.0	M	3	Y	1400	2.4													
46-14	NVLH 450A3	F	Y H	9.2	Y	+ 4	+ 4	17741	84	29.60	80	3	78.0	M	3	Y	1850	3.0	78.0	3	Y	1863	4.0	N			N				
												2	80.0	M	3	Y	1800	3.0													
												4	L																		
46-15	NVLH 450A3	F	Y L	9.2	Y	+ 4	+ 4	17741	84	29.60	80	3	L						L												
												2	L																		
												4	L																		
07-37	NVLH 450A3	F	Y H	9.2	Y	+ 4	+ 4	18078	70	30.40	53	3	95.0	M	3	Y	1700	1.0	92.0	3	Y	1500	5.5	N	97.2	87.0	N				
												2	96.0	M	3	Y	1600	1.0													
												4	94.0	M	3	Y	1500	1.0													
07-38	NVLH 450A3	F	Y L	9.2	Y	+ 4	+ 4	18078	70	30.40	53	3	95.0	M	3	Y	1700	1.0	91.0	3	Y	1600	5.5								
												2	96.0	M	3	Y	1600	1.0													
												4	91.0	M	3	Y	1700	1.0													
06-17	NVSR T28A4	F	Y H	8.9	Y	+10	+10	6383	53	29.85	32	3	88.0	M	4	Y	1200	0.8	88.0	4	Y	1200	2.0	N	92.3	84.0	A	M	4	1200	0.8
												2	90.0	M	2	N	1600	0.8													
												4	87.0	M	4	Y	1200	0.8													

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VEHICLE DESCRIPTION										WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION						
														MAXIMUM						PART THROTTLE								RATER			
						SPARK ADVANCE																									
OBS NO	MODEL CODE	ECT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	NINT	THR	GEAR	RPM	MV
06-18	NVSR T28A4	F	Y	L	8.9	Y	+10	+10	6383	53	29.85	32	3	87.0	M	4	Y	1300	0.8												
													2	83.0	M	2	N	2200	1.4												
													4	85.0	M	4	Y	1200	0.8												
28-06	NVSZ T43A4	F	Y	H	9.2	Y	0	0	10152	70	29.29	58	3	89.0	M	2	N	1900	0.5	F							N				
													2	89.5	M	2	N	3500	0.5												
													4	86.0	M	2	N	2000	0.5												
28-07	NVSZ T43A4	F	Y	L	9.2	Y	0	0	10521	70	29.29	58	3	87.0	M	2	N	1900	0.5	F											
													2	89.5	M	2	N	3500	0.5												
													4	86.0	M	2	N	2000	0.5												
05-39	NVSZ T43A4	F	Y	H	9.2	Y	0	0	10485	70	30.01	52	3	95.0	M	3	N	2300	0.8	F					N	94.0	32.8	A	M	4	1300	0.8
													2	95.0	M	3	N	2300	0.8												
													4	92.0	M	3	N	2450	0.8												
05-40	NVSZ T43A4	F	Y	L	9.2	Y	0	0	10485	70	30.01	52	3	94.0	M	3	N	2400	0.8												
													2	94.0	M	3	N	2400	0.8												
													4	92.0	M	3	N	2450	0.8												
23-11	NVSZ T43A4	F	Y	H	9.2	Y	+ 2	0	12826	60	29.22	42	3	93.0	M	2	N	2500	0.8	F								B	M	2	2500	0.8
													2	93.0	M	2	N	2500	0.8												
													4	92.0	M	2	N	2100	0.8												
23-12	NVSZ T43A4	F	Y	L	9.2	Y	+ 2	0	12826	60	29.22	42	3	87.0	M	2	N	2200	0.8												
													2	88.0	M	2	N	2500	0.8												
													4	86.0	M	2	N	2000	0.8												
23-22	NVSZ T43A4	F	Y	H	9.2	Y	0	0	10179	68	29.02	51	3	90.0	M	3	N	2400	1.6	F							N				
													2	92.0	M	3	N	2400	1.6												
													4	88.0	M	3	N	2300	1.6												
23-23	NVSZ T43A4	F	Y	L	9.2	Y	0	0	10179	68	29.02	51	3	87.0	M	2	N	2000	0.8												
													2	87.0	M	2	N	3000	1.5												
													4	85.0	M	2	N	2000	0.8												
32-29	OVLH 458A3	F	Y	H	8.3	Y	+10	+10	20220	86	29.70	69	3	94.0	M	3	N	2800	1.1	92.0	3	N	2800	3.0	N			B	M	2	2900	0.8
													2	96.0	M	2	N	3200	1.0												
													4	90.0	M	3	N	2450	1.5												
26-16	OVLH 458A3	F	Y	H	8.3	Y	+10	+10	26131	69	29.91	46	3	96.0	M	3	N	2500	1.0	F						92.4		A	M	3	2550	1.0
													2	97.0	M	2	N	3450	1.0												
													4	90.0	M	3	N	2500	1.0												
26-17	OVLH 458A3	F	Y	L	8.3	Y	+10	+10	26131	69	29.91	46	3	94.0	M	3	N	2400	1.0												
													2	96.5	M	3	N	2500	1.0												
													4	89.0	M	3	N	2550	1.0												

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VEHICLE DESCRIPTION: OBS NO	MODEL CODE	ENCT	KNK	SEN	C.R.	AIR	SPARK ADVANCE: AS RCD	SPARK ADVANCE: AS TST	ODOM MILES	WEATHER: AMB TMP	BAROM	HUM	FUEL	OCTANE NUMBER REQUIREMENT DATA: MAXIMUM: OCT NO	THRR	GEAR	CONV	RPM	MV	PART THROTTLE: OCT NO	GEAR	CONV	RPM	MV	TANK FUEL INFORMATION: OWNK	OCT NO: RES	OCT NO: MOT	RATER: NINT	THR	GEAR	RPM	MV
26-36	OVLH 458A3	F	Y	H	8.3	Y	+10	+10	13796	70	30.37	53	3	93.0	M	2	N	2200	1.0	92.0	2	N	2050	2.0	N	97.6		N				
													2	95.0	M	3	N	2250	1.0													
													4	89.0	M	2	N	2150	1.0													
32-34	OVLN P50A4	F	Y	H	9.0	Y	+10	+10	12866	86	29.61	67	3	92.0	M	2	N	3000	1.2	88.0	4	N	1100	2.0	Y			B	M	2	3100	1.0
													2	94.0	M	2	N	3000	1.2													
													4	92.0	M	2	N	3000	1.2													
32-35	OVLN P50A4	F	Y	L	9.0	Y	+10	+10	12866	86	29.61	67	3	87.0	M	2	N	3100	1.2													
													2	88.0	M	2	N	3100	1.2													
													4	87.0	M	2	N	3000	1.2													
28-42	OVLN P50A4	F	Y	H	9.0	Y	+10	+10	21909	70	29.45	50	3	87.0	M	3	N	1900	0.5	85.0	3	N	1900	2.0	N			B	M	3	1800	0.5
													2	88.0	M	3	N	2000	0.5													
													4	86.0	M	3	N	1900	0.5													
06-23	OVLN P50A4	F	Y	H	9.0	Y	+10	+10	6964	37	30.07	18	3	95.0	M	2	N	2600	1.2	F					Y	91.6	83.8	A	M	4	750	1.0
													2	96.0	M	2	N	2700	1.3													
													4	93.0	M	2	N	2400	1.2													
06-24	OVLN P50A4	F	Y	L	9.0	Y	+10	+10	6964	37	30.07	18	3	94.0	M	2	N	2400	1.2	F												
													2	95.0	M	2	N	2500	1.2													
													4	92.0	M	2	N	2500	1.2													
26-34	OVLN P50A4	F	Y	H	9.0	Y			24197	70	30.27	53	3	96.0	M	2	N	2800	1.0	F					Y	92.2		A	M	2	2600	1.0
													2	97.0	M	2	N	3500	1.0													
													4	94.0	M	2	N	2600	1.0													
26-35	OVLN P50A4	F	Y	L	9.0	Y			24197	70	30.27	53	3	94.0	M	2	N	2700	1.0													
													2	96.0	M	2	N	3400	1.0													
													4	94.0	M	2	N	2600	1.0													
05-11	OVLY 149A3	F	N		8.5	N	+18	+18	12842	66	30.54	56	3	94.0	P	3		1600	7.0													
													2	96.0	P	3		1600	5.5													
													4	89.0	P	3		1600	5.5													
32-19	OVLY 149A4	F	N		8.5	Y	+10	+10	15232	86	29.78	64	3	84.0	M	3	N	2000	1.5	82.0	4	N	1150	3.0	N			N				
													2	84.0	M	3	N	2000	1.5													
													4	84.0	M	3	N	1950	1.5													
28-04	OVSA T23M5	F	N		9.5	Y	+10	+10	9258	70	29.48	50	3	87.0	M	3	N	1800	0.5	F								N				
													2	87.0	M	3	N	1700	0.5													
													4	84.0	M	3	N	1900	0.5													
65-15	OVSS 228A4	F	Y	H	8.7	Y	+10	+10	16730	50	29.75	40	3	92.5	M	4	Y	1800	5.0	F								N				
													2	93.5	M	4	Y	2000	5.0													
													4	88.0	M	4	Y	1800	5.0													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE						OCT NO		RATER				
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OMKNK	RES	MOT	NINT	THR	GEAR	RPM	MV
65-16	OVSS 228A4	F	Y L	8.7	Y	+10	+10	16730	50	29.75	40	3	92.5	M	4	Y	1800	5.0	F												
												2	93.5	M	4	Y	2000	5.0													
												4																			
26-18	OVSS 228A4	F	Y H	8.7	Y	+10	+10	26314	74	29.83	50	3	86.0	M	3	N	2450	1.5	82.0	4	N	2050	5.0		92.4		N				
												2	86.0	M	4	N	1750	3.5													
												4	84.0	M	3	N	2450	1.5													
26-19	OVSS 228A4	F	Y L	8.7	Y	+10	+10	26314	74	29.83	50	3	84.0	M	3	N	2350	1.5													
												2	84.0	M	2	N	2500	1.5													
												4	81.0	M	3	N	2450	1.5													
41-32	OVSS 228M5	C	Y H	8.7	Y	+10	+10	14695	69	29.69	59	3	91.0	M	4	N	2700	0.6	F					N	93.2	83.1	N				
												2	92.5	M	4	N	2700	0.6													
												4	89.0	M	4	N	2700	0.6													
05-21	OVSU P30A4	F	Y H	9.3	Y	+10	+10	20845	68	30.35	80	3	90.0	M	4	N	1900	2.0	88.0	4	N	1650	6.0								
												2	92.0	M	4	N	1800	2.0													
												4	89.0	M	4	N	2000	1.5													
05-22	OVSU P30A4	F	Y L	9.3	Y	+10	+10	20845	68	30.35	80	3	90.0	M	4	N	1900	2.0													
												2	91.0	M	4	N	1800	2.0													
												4	89.0	M	4	N	2000	1.5													
32-22	OVSU P30A4	F	Y H	9.3	Y	+10	+10	13650	86	29.59	64	3	80.0	M	4	Y	2000	0.8	80.0	4	Y	1700	4.0	N			N				
												2	80.0	M	4	Y	2000	0.8													
												4	80.0	M	4	Y	2000	0.8													
32-23	OVSU P30A4	F	Y L	9.3	Y	+10	+10	13650	86	29.59	64	3	78.0	M	4	Y	2000	0.8													
												2	78.0	M	4	Y	2000	0.8													
												4	78.0	M	4	Y	2000	0.8													
07-12	OVSU P30A4	F	Y H	9.0	Y	+10	+10	13617	69	30.29	45	3	88.0	M	3	N	2850	0.5	84.0	4	N	1800	2.0				B	M	3	3100	0.5
												2	87.0	M	4	N	1950	0.5													
												4	85.0	M	4	N	1850	0.5													
07-13	OVSU P30A4	F	Y L	9.0	Y	+10	+10	13617	69	30.29	45	3	85.0	M	4	N	1950	0.5	82.0	4	N	1900	2.0								
												2	85.0	M	3	N	3100	0.5													
												4	84.0	M	4	N	1900	0.5													
29-15	PVSG 226A3	F	N	8.7	Y	+ 7	+ 7	16168	70	30.40	62	3	92.0	M	2	N	2200	2.5	91.5	3	N	2300	5.0	Y			A	M	2	2500	2.5
												2	94.0	M	2	N	2200	2.5													
												4	90.5	M	2	N	2400	2.5													
47-05	PVSG 226A3	C	N	8.7	Y	+10	+ 7	13180	70	30.10	50	3	87.0	M	3	N	3250	1.0													
												2	90.0	M	3	N	3750	1.0													
												4	84.5	M	3	N	2500	2.2													

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OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	SPARK ADVANCE AS RCD	SPARK ADVANCE AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	MAXIMUM OCT NO	MAXIMUM THR	MAXIMUM GEAR	MAXIMUM CONV	MAXIMUM RPM	MAXIMUM MV	PART THROTTLE OCT NO	PART THROTTLE GEAR	PART THROTTLE CONV	PART THROTTLE RPM	PART THROTTLE MV	OKNK	OCT NO RES	OCT NO MOT	NITR	RATER THR	RATER GEAR	RPM	MV
	VEHICLE DESCRIPTION								WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
47-06	PVSG 226A3	C	N	8.7	Y	+ 7	+ 7	6420	70	30.18	50	3	88.5	M	3	N	2750	2.5	86.0	3	N	2250	3.5								
												2	89.5	M	3	N	2750	2.5													
												4	85.0	M	2	N	2750	1.4													
47-12	PVSG 226A3	C	N	8.7	Y	+ 5	+ 7	11040	70	29.98	50	3	93.5	M	3	N	2500	1.2	F												
												2	95.0	M	3	N	2500	1.2													
												4	88.0	M	3	N	2500	1.2													
46-06	PVSG 226A3	F	N	8.7	Y	+ 7	+ 7	7744	75	29.25	90	3	87.0	M	3	N	2450	2.0	86.0	3	N	2500	3.0	N	94.7	85.5	N				
												2	88.0	M	3	N	2500	2.0													
												4	86.0	M	3	N	2400	2.0													
41-08	RVSH T25M5	C	N	9.2	Y	+ 8	+ 8	17662	64	30.00	53	3	86.0	M	3	N	3200	0.6	F					Y	92.8	93.7	N				
												2	87.0	M	3	N	3200	0.6													
												4	85.0	M	3	N	3200	0.6													
06-21	AVSM 228A3	F	N	8.5	Y	+12	+12	13039	40	29.94	22	3	96.0	M	3	N	2500	0.8	96.0	3	N	2500	2.2	0	93.3	92.8	A	M	3	2500	0.8
												2	98.0	M	2	N	4300	1.2													
												4	94.0	M	2	N	4300	1.2													
07-18	A P20A3	F	Y H	9.2	Y	+12	+14	6264	66	30.25	56	3	88.0	M	2	N	2900	0.7	86.0	3	N	2200	0.8	N	91.5	84.6	N				
												2	90.0	M	2	N	2450	0.7													
												4	89.0	M	3	N	2500	0.8													
07-19	A P20A3	F	Y L	9.2	Y	+12	+14	6264	66	30.25	56	3	87.0	M	2	N	2800	0.7	86.0	3	N	2200	8.5								
												2	88.0	M	2	N	2600	0.7													
												4	87.0	M	2	N	2550	0.7													
65-13	B P18A3	F	N	8.5	Y	+ 6	+ 6	6120	64	29.06	76	3	85.5	M	3	N	2700	0.5	F								N				
												2	87.0	M	3	N	2800	0.5													
												4	85.0	M	2	N	3100	0.5													
08-22	C 215A3	F	N	9.4	Y	+ 5	+ 5	7742	75	29.98	76	3	88.0	M	3	N	1800	2.5	84.0	3	N	1800	6.0				N				
												2	89.0	M	3	N	1800	2.5													
												4	87.0	M	3	N	1900	2.5													
26-13	C 215A3	F	N	9.4	Y	+ 5	+ 5	15065	74	29.86	48	3	87.0	M	2	N	2300	1.0	F						92.1		N				
												2	87.0	M	2	N	2800	1.0													
												4	85.0	M	2	N	2100	1.0													
07-30	C 215M4	F	N	9.4	N	+ 5	+ 5	7416	68	30.49	55	3	87.0	M	3	N	1800	0.8	87.0	4	N	1700	6.0	N			N				
												2	87.0	M	3	N	1900	0.8													
												4	84.0	M	4	N	1900	0.8													
41-14	E 216A3	C	N	9.4	N	+ 5	+ 5	8540	66	30.05	54	3	91.0	M	2	N	2300	0.8	F					N	92.7	93.1	B	M	2	2300	0.8
												2	92.0	M	2	N	2300	0.8													
												4	89.0	M	2	N	2300	0.8													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
						SPARK ADVANCE							MAXIMUM						PART THROTTLE								RATER				
OBS NO	MODEL CODE	ECT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	TECH R	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	NINT	TECH R	GEAR	RPM	MV
65-12	E 216A3	F	N	9.4	N	- 3	+ 3	12150	72	29.66	43	3	98.5	M	3	Y	3050	1.5	F								A	M	3	3050	1.5
												2	99.5	M	3	Y	3050	1.5													
												4	93.0	M	3	N	2800	1.0													
47-10	E 216A3	C	N	9.4	Y	+ 5	+ 5	16517	70	30.14	50	3	90.0	M	3	Y	3000	0.6	F												
												2	92.0	M	3	Y	3000	0.6													
												4	89.0	M	3	Y	2750	0.6													
62-05	E 216A3	F	N	9.4	Y	+10	+10	7995	69	30.35	58	3	87.5	M	2	N	3250	2.4	F					N	98.2	86.0	N				
												2	89.0	M	3	Y	3000	3.5													
												4	84.0	M	3	Y	2950	3.5													
06-19	E 216M5	F	N	9.4	N	+10	+10	12745	63	30.03	48	3	86.0	P	4	N	2500	4.0	86.0	4	N	2500	4.0	N	92.9	82.8	N				
												2	90.0	P	4	N	2800	4.0													
												4	86.0	M	4	N	2200	1.8													
28-03	E P20A3	F	N	8.5	Y	+ 4	+ 4	9914	70	29.20	70	3	87.0	M	2	N	2400	0.5	F								N				
												2	90.0	M	2	N	2500	0.5													
												4	84.0	M	2	N	2600	0.5													
41-24	E P20A4	C	N	8.5	Y	+15	+15	12976	69	29.96	56	3	92.0	M	3	N	3750	0.8	F						94.2	83.1	N				
												2	93.0	M	3	N	3750	0.8													
												4	90.0	M	3	N	3750	0.8													
55-22	E P20A4	F	N	8.5	N	0	0	7020	65	29.34	72	3	81.0	M	3	N	3000	0.0	F								N				
												2	82.0	M	3	N	3000	0.0													
												4	81.0	M	4	Y	1800	2.5													
05-12	E P20M5	F	N	8.5	Y	+ 4	+ 4	9527	69	30.40	54	3	81.0	M	4	N	1300	0.7	F					N	90.8	82.4	N				
												2	82.0	M	4	N	1325	0.7													
												4	81.0	M	4	N	1275	0.7													
62-12	E P20M5	F	N	8.5	Y	+ 4	+ 4	8178	68	30.25	56	3	87.0	M	4	N	2300	0.4	86.0	4	N	2700	5.0	N	93.3	82.9	N				
												2	87.0	P	4	N	2900	5.0													
												4	83.0	M	4	N	2800	0.4													
26-37	E P20M5	F	N	8.5	Y	+ 4	+ 4	7854	68	30.10	51	3	86.0	M	4	N	3500	0.5	85.0	3	N	3600	6.0	N	97.6		N				
												2	92.0	P	4	N	3500	6.0													
												4	84.0	M	4	N	3300	0.5													
47-09	E P30A4	C	N	9.0	Y	+20	+20	8000	70	30.08	50	3	83.0	M	4	Y	2100	1.0	81.0	4	Y	2100	3.0								
												2	83.0	M	4	Y	2250	1.0													
												4	83.0	M	4	Y	2100	1.0													
62-07	E P30A4	F	N	9.0	Y	+20	+20	13262	68	30.23	40	3	84.0	M	3	N	2800	0.6	82.0	4	Y	1800	6.0	N	92.3	82.6	N				
												2	86.0	M	2	N	3350	0.7													
												4	82.0	M	4	Y	2000	0.5													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																									
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	NITNT	THR	GEAR	RPM	MV
62-11	E P30A4	F	N	9.0	Y	+20	+20	9690	68	30.43	56	3	88.0	M	3	N	2800	0.7	F					N	93.1	82.4	N				
												2	87.0	M	4	Y	1900	0.5													
												4	87.0	M	3	N	2800	0.7													
07-35	E P30M5	F	N	9.0	Y	+20	+20	9886	70	30.34	51	3	86.0	M	4	N	2300	0.3	85.0	4	N	1450	3.0	N	94.5	84.1	N				
												2	86.0	M	4	N	2300	0.3													
												4	85.0	M	4	N	2250	0.3													
40-08	E TP30A4	F	Y H	7.8	Y	+15	+15	13075	48	29.93	30	3	88.0	M	2	N	4600	-7.0	F						92.0	84.0	N				
												2	90.0	M	2	N	4600	-7.0													
												4	89.0	M	2	N	4200	-7.0													
40-09	E TP30A4	F	Y L	7.8	Y	+15	+15	13075	48	29.93	30	3	88.0	M	2	N	4600	-7.0	F												
												2	87.0	M	2	N	3850	-7.0													
												4	89.0	M	2	N	4200	-7.0													
65-23	E TP30A4	F	Y H	7.8	Y	+15	+15	7429	74	29.36	77	3	85.0	P	4	N	1750	1.0	85.0	4	N	1750	1.0				N				
												2	83.0	P	4	N	1900	1.0													
												4	85.5	P	4	N	1900	1.0													
65-24	E TP30A4	F	Y L	7.8	Y	+15	+15	7429	74	29.36	77	3	84.0	P	4	N	1900	1.0	84.0	4	N	1900	1.0								
												2	83.0	P	4	N	1900	1.0													
												4	85.5	P	4	N	1900	1.0													
62-09	E TP30M5	F	Y H	7.8	Y	+20	+20	7158	70	30.17	51	3	84.5	P	4	N	2800	-2.5	84.5	4	N	2800	-2.5	N	94.3	84.1	N				
												2	87.0	P	4	N	2800	-2.5													
												4	85.0	P	4	N	2900	-2.5													
62-10	E TP30M5	F	Y L	7.8	Y	+20	+20	7158	70	30.17	51	3	84.0	P	4	N	2800	-2.5	84.0	4	N	2800	-2.5								
												2	85.0	P	4	N	2750	-2.5													
												4	84.0	P	4	N	2900	-2.5													
46-20	J 220A4	F	N	9.1	Y			13448	75	29.21	82	3	80.0	M	3	N	2750	2.5	78.0	4	Y	2500	3.5	N	91.4	83.5	N				
												2	80.0	M	3	Y	2650	2.5													
												4	79.0	M	3	N	2650	2.5													
47-30	J 220A4	C	N	9.1	Y	+15	+15	6550	70	30.05	50	3	83.0	M	4	N	3000	2.0	81.0	4	N	3000	3.0								
												2	87.0	M	4	N	3000	2.0													
												4	82.0	M	3	N	4000	1.5													
06-02	J 313M4	F	N	10.0	N	+21	+21	7663	79	30.04	101	3	91.0	M	4	N	1700	1.3	90.0	4	N	1500	1.9	N	99.1	88.2	N				
												2	93.0	M	3	N	2400	1.3													
												4	93.0	M	4	N	1700	1.3													
05-10	J 315M5	F	N	9.6	Y	+26	+26	11030	69	29.75	50	3	87.0	M	4	N	1525	0.9	F					N	92.2	82.2	N				
												2	88.0	M	4	N	1500	0.9													
												4	87.0	M	4	N	1550	0.9													

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	VEHICLE DESCRIPTION								WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																			OCT NO						
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	RES	MOT	NINT	THR	GEAR	RPM	MV
47-35	J P20M5	C	N	8.8	Y	+15	+15	6800	70	30.24	50	3	88.0	M	4	N	2500	0.0	F												
												2	88.0	M	4	N	2500	0.0													
												4	87.0	M	4	N	2500	0.0													
26-25	J P20M5	F	N	8.8	Y	+15	+15	17008	70	29.82	53	3	83.0	M	4	N	2150	0.5	F					N	98.2		N				
												2	85.0	M	3	N	2100	0.5													
												4	82.0	M	4	N	2050	0.5													
05-30	MI 220A3	F	N	8.5	Y	+ 7	+ 7	9205	66	30.50	32	3	90.0	M	3	N	2600	2.0	F					N	92.3	82.4	N				
												2	92.0	M	3	N	2700	2.0													
												4	88.0	M	3	N	2100	2.0													
05-31	N 210M5	F	N	9.5	Y	+10	+10	6364	66	30.56	46	3	87.0	M	4	N	2750	1.0	84.5	4	N	2200	2.0	N	93.0	81.2	N				
												2	89.0	M	4	N	2850	1.0													
												4	86.0	M	4	N	2750	1.0													
47-14	N 215M5	C	N	9.6	Y	+ 3	+ 3	15500	70	30.02	50	3	88.0	M	4	N	1500	2.0	86.0	4	N	1500	3.0								
												2	88.0	M	4	N	1500	2.0													
												4	88.0	M	4	N	1500	2.0													
08-34	T 215A3	A	N	9.0	Y	+ 5	+ 5	7309	79	29.77	85	3	91.0	M	3	N	2450	2.0	F								N				
												2	92.0	M	2	N	3300	0.5													
												4	86.0	M	3	N	2550	2.0													
65-21	T 215A3	C	N	9.0	N	+ 8	+ 5	10037	73	29.23	92	3	87.5	M	3	N	2900	1.0	F								N				
												2	90.0	M	2	N	3900	0.0													
												4	87.0	M	3	N	2800	1.0													
60-06	T 216A3	F	N	9.0	Y	+ 5	+ 5	15038	72	29.95	46	3	88.0	M	2	N	3100	0.8	F					N	93.1	82.7	N				
												2	88.0	M	3	N	3200	0.9													
												4	87.0	M	2	N	3050	0.8													
60-07	T 216A3	F	N	9.0	Y	+ 7	+ 5	6922	69	30.11	51	3	92.0	M	2	N	3250	1.2	F					N	92.2	82.4	N				
												2	94.0	M	3	N	3200	1.2													
												4	87.0	M	3	N	3050	1.2													
26-15	T 216A3	F	N	9.0	Y	+ 5	+ 5	16226	76	29.82	48	3	90.0	M	2	N	3000	1.0	F						92.2		8	N	2	2450	1.0
												2	93.0	M	2	N	2900	1.0													
												4	88.0	M	2	N	2600	1.0													
47-11	T 216M3	C	N	9.0	Y	+ 5	+ 5	7800	70	30.06	50	3	92.0	M	3	Y	2750	0.5	89.0	3	Y	2750	1.5								
												2	93.0	M	3	Y	2750	0.5													
												4	90.0	M	3	Y	2250	0.5													
41-30	T 216M5	C	N	9.0	N	+ 5	+ 5	8335	67	29.98	55	3	92.0	M	3	N	4000	0.6	F					N	93.3	82.6	8	N	3	4000	0.6
												2	93.0	M	3	N	4000	0.6													
												4	91.0	M	3	N	4000	0.6													

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	VEHICLE DESCRIPTION								WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																									
OBS NO	MODEL CODE	ECT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	ONKNK	OCT NO RES	OCT NO MOT	NINT	THR	GEAR	RPM	MV
08-15	T P20A4	F	N	8.7	Y	+10	+10	6988	80	30.00	89	3	91.0	M	3	N	2350	2.0	F								8	M	3	2300	2.0
												2	92.0	M	3	N	2400	2.0													
												4	88.0	M	2	N	3350	0.5													
08-23	T P20A4	A	N	8.7	Y	+10	+10	14877	78	29.73	97	3	87.0	M	3	N	2200	1.0	84.0	3	N	1900	6.0				N				
												2	88.0	M	2	N	3500	0.5													
												4	86.0	M	3	N	2150	1.0													
29-13	T P20A4	F	N	8.7	Y	+10	+10	9098	70	30.40	62	3	93.0	M	2	N	2300	1.1	F					Y			A	M	2	2300	1.1
												2	94.0	M	3	Y	2300	1.0													
												4	91.0	M	3	Y	2300	1.0													
06-03	T P20A4	F	N	8.7	Y	+10	+10	11417	95	29.69	121	3	90.0	M	3	N	2400	0.6	F					N	92.3	82.5	N				
												2	91.0	M	3	N	2400	0.6													
												4	89.0	M	3	N	2400	0.6													
05-14	T P20A4	F	N	8.7	Y	+10	+10	8183	70	30.25	54	3	89.0	M	3	Y	2200	1.0	F												
												2	89.5	M	3	Y	2200	1.0													
												4	87.0	M	3	Y	2175	1.0													
05-19	T P20A4	F	N	8.7	Y	+10	+10	7638	68	30.36	51	3	91.0	M	4	N	2050	1.0	F												
												2	93.0	M	4	N	2050	1.0													
												4	90.0	M	4	N	2125	1.0													
60-02	T P20A4	F	N	8.7	Y	+10	+10	5425	72	30.19	64	3	89.0	M	3	N	2050	0.6	88.0	3	N	2200	2.5	N	93.0	82.4	N				
												2	91.0	M	3	N	2100	0.6													
												4	87.0	M	3	N	1950	0.5													
29-02	T P20M5	F	N	9.2	Y	+10	+10	9711	70	29.20	70	3	85.0	M	3	N	1300	0.5	84.0	4	N	1400	1.5				N				
												2	84.0	M	4	N	2000	0.5													
												4	85.0	M	3	N	1900	0.5													
65-29	T P20M5	F	N	9.2	Y	+10	+10	6142	59	29.66	51	3	88.5	M	3	N	3200	0.0	87.5	4	N	2750	2.0				N				
												2	88.5	M	4	N	3000	0.0													
												4	88.0	M	3	N	2800	0.0													
60-10	T P20M5	F	N	9.0	Y	+10	+10	17130	68	30.32	56	3	91.0	M	4	N	2750	0.4	F					N	93.6	82.7	N				
												2	91.0	M	4	N	3250	0.4													
												4	92.0	M	4	N	2100	0.4													
65-25	T P28A4	F	Y H	9.2	Y	+10	+10	6705	71	29.55	87	3	90.0	P	4	Y	2000	2.0	90.0	4	Y	2000	2.0				N				
												2	92.0	P	4	Y	2050	2.0													
												4	88.0	M	4	Y	1700	0.0													
65-26	T P28A4	F	Y L	9.2	Y	+10	+10	6750	71	29.55	86	3	88.0	P	4	Y	2000	2.0	88.0	4	Y	2000	2.0								
												2	90.0	M	3	N	2500	0.0													
												4	88.0	M	4	Y	1600	0.0													

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VEHICLE DESCRIPTION									WEATHER			OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
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						SPARK ADVANCE																			OCT NO						
OBS NO	MODEL CODE	ENCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	THR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWNK	RES	MOT	NINT	THR	GEAR	RPM	MV
60-11	T P30A4	F	Y H	9.2	Y	+10	+10	7184	66	30.06	51	3	82.0	M	4	Y	2400	0.5	78.0	4	Y	2400	4.5	N	93.7	83.1	N				
												2	84.0	M	4	Y	2150	0.5													
												4	95.0	M	2	N	3350	0.6													
60-12	T P30A4	F	Y L	9.2	Y	+10	+10	7184	66	30.06	51	3	80.0	M	3	N	2950	0.6	78.0	4	Y	2400	4.5								
												2	84.0	M	4	Y	2100	0.5													
												4	83.0	M	2	N	3400	0.6													
65-19	X P27A4	F	N	9.0	Y			12209	61	29.83	43	3	88.0	M	4	N	1700	0.5	86.0	4	N	1700	4.0				N				
												2	89.0	M	4	N	1700	0.5													
												4	88.5	M	4	N	1700	0.5													
28-43	X P27A4	F	N	9.0	Y			17747	70	29.24	50	3	85.0	M	2	N	3250	0.5	82.0	3	N	2100	2.0	N			N				
												2	87.0	M	2	N	3400	0.5													
												4	86.0	M	2	N	3200	0.5													
07-09	Z P16M4	F	N	9.3	N	+ 2	+ 2	11379	67	30.34	58	3	88.0	M	4	N	2200	0.5	86.0	4	N	2200	1.5	N	93.2	83.7	N				
												2	91.0	M	4	N	2300	0.5													
												4	87.0	M	4	N	2350	0.5													
41-31	Z P20M5	C	N	8.6	Y	+ 6	+ 6	6885	65	29.91	58	3	87.0	M	4	N	2000	0.5	F					N	93.5	83.8	N				
												2	87.0	M	4	N	2000	0.5													
												4	85.0	M	4	N	2000	0.5													
47-07	Z TP20M5	C	Y H	7.8	Y	+ 7	+ 7	15240	70	30.04	50	3	90.5	P	4	N	2500	-3.0	90.5	4	N	2500	-3.0	N	94.0	84.5	N				
												2	91.5	M	3	N	4000	-7.0													
												4	90.5	M	3	N	4000	-7.0													
47-08	Z TP20M5	C	Y L	7.8	Y	+ 7	+ 7	15240	70	30.04	50	3	90.0	P	4	N	2500	-3.0	90.0	4	N	2500	-3.0								
												2	91.0	M	3	N	4000	-7.0													
												4	90.0	M	3	N	4000	-7.0													
41-07	CT 226M5	C	N	8.5	N	+ 7	+ 7	11105	69	29.98	52	3	90.0	M	4	N	1900	0.8	88.5	4	N	1900	1.8	N	93.3	82.6	N				
												2	91.5	M	4	N	1900	0.8													
												4	90.0	M	4	N	1900	0.8													
47-29	TT 216M4	C	N	9.0	N	0	0	20000	70	30.15	50	3	92.0	M	3	N	3100	0.4	93.0	4	N	1300	1.5								
												2	95.0	M	3	N	3100	0.4													
												4	95.0	M	4	N	1400	0.4													
41-16	TT P24M5	C	Y H	9.3	Y	+ 5	+ 5	18305	70	30.07	49	3	96.0	M	4	N	2800	0.5	F					Y	93.2	83.1	8	M	4	2800	0.5
												2	97.0	M	4	N	2800	0.5													
												4	94.0	M	4	N	2800	0.5													
41-17	TT P24M5	C	Y L	9.3	Y	+ 5	+ 5	18305	70	30.07	49	3	82.0	M	4	N	2800	0.5	F												
												2	82.0	M	4	N	2800	0.5													
												4	82.0	M	4	N	2800	0.5													

1986 CRC OCTANE NUMBER REQUIREMENT SURVEY

VEHICLE DESCRIPTION										WEATHER		OCTANE NUMBER REQUIREMENT DATA												TANK FUEL INFORMATION							
													MAXIMUM						PART THROTTLE								RATER				
						SPARK ADVANCE																			OCT NO						
OBS NO	MODEL CODE	EMCT	KNK SEN	C.R.	AIR	AS RCD	AS TST	ODOM MILES	AMB TMP	BAROM	HUM	FUEL	OCT NO	TECHR	GEAR	CONV	RPM	MV	OCT NO	GEAR	CONV	RPM	MV	OWKNK	RES	MOT	NIT	THR	SEAR	RPM	MV
05-18	TT P24M5	F	Y H	9.5	Y	+ 6	+ 6	9201	69	29.85	58	3	80.0	M	4	N	1330	0.4	79.0	4	N	1325	6.0								
												2	80.0	M	4	N	1425	0.4													
												4	80.0	M	4	N	1330	0.4													
60-05	TT P24M5	F	Y H	9.3	Y	+ 5	+ 5	11060	70	30.09	56	3	85.0	M	4	N	2000	0.2	82.0	4	N	1750	1.5	N	92.9	82.4	N				
												2	86.0	M	3	N	2850	0.2													
												4	96.0	M	3	N	2000	0.2													
60-04	TV P22A4	F	N	8.8	Y	+12	+12	6875	71	29.90	60	3	92.0	P	3	Y	2100	3.5	92.0	3	Y	2100	3.5	N			8	M	3	3000	0.9
												2	92.0	P	3	Y	2400	3.5													
												4	90.0	M	3	N	2900	0.9													
47-13	ZV 220M5	C	N	8.6	Y	+ 6	+ 6	15800	70	30.02	50	3	93.0	M	4	N	3000	1.2	F												
												2	93.0	M	4	N	3000	1.2													
												4	92.0	M	4	N	2250	1.2													

APPENDIX F

PROCEDURES FOR CALCULATING AND PLOTTING OCTANE NUMBER REQUIREMENT DISTRIBUTION DATA

WEIGHTED VEHICLE/CAR POPULATIONS

Weighting factors for each vehicle model were developed from information supplied by the US vehicle manufacturers and from information published (Ward's Automotive Reports) for imported vehicles. These weight factors were proportioned to the relative production and/or sales volumes of the vehicles tested.

For any vehicle having octane requirements lower (L) than the lowest octane number fuel available within a given fuel series, a number 0.5 Research/0.4 Motor lower was assigned. Similarly, for any vehicle having octane requirements higher (H) than the highest octane fuel available within a given fuel series, a number 0.5 Research/0.4 Motor higher was assigned.

The weighting factors of each vehicle model were divided by the number of vehicles tested to calculate individual vehicle weight factors. The octane requirements for each vehicle were then arranged in increasing order with the appropriate individual weighting factors. The percent of vehicles at each octane requirement level represents the summation of all vehicle weighting factors before that level, plus one-half the sum of the weighting factors at that level. The individual vehicle weighting factors are adjusted so that the summation of all weighting factors is 100.00 for any vehicle population of interest. The midpoint percentiles are plotted versus octane number requirement on arithmetic probability paper and a distribution curve is drawn through the points.

SELECT CAR MODELS

For individual car models, the octane number requirement distribution curves were plotted by the "Z" method as described in "Statistical Estimation of the Gasoline Octane Number Requirement of New Model Automobiles," C. S. Brinegar and R. R. Miller, Technometrics, Vol. 2, No. 1, February 1960.

The procedure is as follows:

> For any cars having octane requirements lower (L) than the lowest octane number fuel available within a given fuel level, a number 1.0 Research/0.7 Motor lower was assigned. Similarly, for individual cars having octane requirements higher (H) than the highest octane fuel available within a given fuel series, a number 1.5 Research/1.1 Motor higher was assigned.
>
> Using all observed and estimated octane number values, calculate the mean ($\bar{X}$) and the standard deviation (s) from the data for each car model.

$$s = \left[\frac{1}{n-1} \sum_{i=1}^{n} (X_i - \overline{X})^2 \right]^{1/2}$$

Where X_i = Octane number requirement of i^{th} car of a given model

n = Number of cars of that model.

Estimate octane number requirements at the percentiles of interest from octane number requirement distribution data by

$$O.N. = \overline{X} + ks$$

Where k is selected from normal distribution tables.

Values of k used to calculate percentiles in this report are:

Percentile	k
5	-1.645
10	-1.282
20	-0.842
30	-0.524
40	-0.253
50	0
60	+0.253
70	+0.524
80	+0.842
90	+1.282
95	+1.645

APPENDIX G

CONFIDENCE LIMITS OF OCTANE NUMBER REQUIREMENT DISTRIBUTIONS

CONFIDENCE LIMITS OF OCTANE NUMBER REQUIREMENT DISTRIBUTIONS

Octane number requirements of vehicles presented in this Survey are determined at the levels that satisfy certain percentages of specific vehicle populations. In many cases, the recorded octane number requirement is followed by a plus and minus limit, referred to as the confidence interval. These limits are expected to bound the true requirement of the population represented by the test vehicles 95 percent of the time in replicate testing of the same number of test vehicles.

At the 50 percent satisfaction level, the 95 percent confidence interval is calculated as follows:

$$CI = \pm ts/(n)^{1/2}$$

where t = Students t at the proper number of degrees of freedom*

s = Standard deviation, calculated directly from the data or estimated as the difference between the 84.16th and 50th percentiles (assuming normal distribution)

n = Number of vehicles in population.

At other satisfaction levels:

$$CI = \pm ts \quad 1/n + k^2/[2(n-1)] \quad ^{1/2}$$

At the 90 percent satisfaction level, k = 1.2817. For other satisfaction levels, appropriate values for k may be found in the standard statistical tables.

Degrees of Freedom**	t	Degrees of Freedom**	t
1	12.706	18	2.101
2	4.393	19	2.093
3	3.182	20	2.086
4	2.776	21	2.080
5	2.571	22	2.074
6	2.447	23	2.069
7	2.365	24	2.064
8	2.306	25	2.060
9	2.262	26	2.056
10	2.228	27	2.052
11	2.201	28	2.048
12	2.179	29	2.045
13	2.160	30	2.042
14	2.145	40	2.021
15	2.131	60	2.000
16	2.120	120	1.980
17	2.110	∞	1.960

* Distribution of t for probability = 0.05.

** Degrees of Freedom = (n-1).

TABLE G-I

95% CONFIDENCE LIMITS FOR MAXIMUM OCTANE NUMBER REQUIREMENTS

1986 Weighted Population Groups

				Standard Dev.			95% Confidence Limits					
		No.					(R+M)/2		RON		MON	
Population	Fuel	Veh.	t	(R+M)/2	RON	MON	50%	90%	50%	90%	50%	90%
US and Imported Vehicles												
Includes Knock Sensor	PR	376	1.966	4.25	4.25	4.25	0.43	0.58	0.43	0.58	0.43	0.58
Maximum (High-Borderline)	FBRU	377	1.966	3.21	4.05	2.37	0.32	0.43	0.41	0.55	0.24	0.32
Requirements	FBRSU	377	1.966	3.58	4.34	2.82	0.36	0.49	0.44	0.59	0.29	0.39
Includes Knock Sensor	PR	359	1.967	4.20	4.20	4.20	0.44	0.59	0.44	0.59	0.44	0.59
Minimum (Low-Borderline)	FBRU	362	1.967	3.28	4.19	2.37	0.34	0.46	0.43	0.59	0.25	0.33
Requirements	FBRSU	362	1.967	3.76	4.62	2.90	0.39	0.52	0.48	0.64	0.30	0.40
US and Imported Cars												
Includes Knock Sensor	PR	305	1.968	4.18	4.18	4.18	0.47	0.64	0.47	0.64	0.47	0.64
Maximum (High-Borderline)	FBRU	306	1.968	3.10	3.95	2.25	0.34	0.47	0.44	0.60	0.25	0.34
Requirements	FBRSU	306	1.968	3.52	4.32	2.73	0.40	0.53	0.49	0.66	0.31	0.41
Includes Knock Sensor	PR	299	1.968	3.86	3.86	3.86	0.44	0.59	0.44	0.59	0.44	0.59
Minimum (Low-Borderline)	FBRU	301	1.968	2.94	3.77	2.12	0.33	0.45	0.43	0.58	0.24	0.32
Requirements	FBRSU	301	1.968	3.42	4.22	2.62	0.39	0.52	0.48	0.65	0.30	0.40
US Vehicles												
Includes Knock Sensor	PR	313	1.968	4.15	4.15	4.15	0.46	0.62	0.46	0.62	0.46	0.62
Maximum (High-Borderline)	FBRU	314	1.968	3.49	4.37	2.62	0.39	0.52	0.49	0.66	0.29	0.39
Requirements	FBRSU	314	1.968	3.90	4.69	3.11	0.43	0.58	0.52	0.70	0.35	0.47
Includes Knock Sensor	PR	298	1.968	4.19	4.19	4.19	0.48	0.64	0.48	0.64	0.48	0.64
Minimum (Low-Borderline)	FBRU	301	1.968	3.53	4.47	2.59	0.40	0.54	0.51	0.68	0.29	0.40
Requirements	FBRSU	301	1.968	4.18	5.11	3.25	0.47	0.64	0.58	0.78	0.37	0.50

TABLE G-I
(Continued)

95% CONFIDENCE LIMITS FOR MAXIMUM OCTANE NUMBER REQUIREMENTS

1986 Weighted Population Groups

Population	Fuel	No. Veh.	t	Standard Dev. (R+M)/2	Standard Dev. RON	Standard Dev. MON	95% Confidence Limits (R+M)/2 50%	(R+M)/2 90%	RON 50%	RON 90%	MON 50%	MON 90%
US Cars												
Includes Knock Sensor	PR	249	1.970	4.33	4.33	4.33	0.54	0.73	0.54	0.73	0.54	0.73
Maximum (High-Borderline)	FBRU	250	1.970	3.52	4.41	2.63	0.44	0.59	0.55	0.74	0.33	0.44
Requirements	FBRSU	250	1.970	3.99	4.83	3.15	0.49	0.67	0.60	0.81	0.39	0.53
Includes Knock Sensor	PR	243	1.970	4.02	4.02	4.02	0.51	0.69	0.51	0.69	0.51	0.69
Minimum (Low-Borderline)	FBRU	245	1.970	3.16	4.01	2.31	0.39	0.53	0.50	0.68	0.29	0.39
Requirements	FBRSU	245	1.970	3.84	4.70	2.98	0.48	0.65	0.59	0.80	0.37	0.51
Imported Vehicles												
Includes Knock Sensor	PR	63	1.998	4.52	4.52	4.52	1.14	1.54	1.14	1.54	1.14	1.54
Maximum (High-Borderline)	FBRU	63	1.998	2.83	3.64	2.02	0.71	0.96	0.92	1.24	0.51	0.69
Requirements	FBRSU	63	1.998	2.54	3.16	1.92	0.64	0.87	0.80	1.08	0.48	0.66
Includes Knock Sensor	PR	61	2.000	4.27	4.27	4.27	1.09	1.48	1.09	1.48	1.09	1.48
(Minimum (Low-Borderline)	FBRU	61	2.000	2.89	3.73	2.06	0.74	1.00	0.95	1.29	0.53	0.71
Requirements	FBRSU	61	2.000	2.86	3.58	2.15	0.73	0.99	0.92	1.24	0.55	0.74
Knock Sensor Vehicles Only												
Includes Knock Sensor	PR	134	1.978	4.24	4.24	4.24	0.72	0.98	0.72	0.98	0.72	0.98
Maximum (High-Borderline)	FBRU	134	1.978	3.81	4.74	2.89	0.65	0.88	0.81	1.09	0.49	0.67
Requirements	FBRSU	134	1.978	3.86	4.62	3.10	0.66	0.89	0.79	1.07	0.53	0.72
Includes Knock Sensor	PR	117	1.980	4.28	4.28	4.28	0.78	1.06	0.78	1.06	0.78	1.06
Minimum (Low-Borderline)	FBRU	119	1.979	4.26	5.49	3.03	0.77	1.04	1.00	1.35	0.55	0.74
Requirements	FBRSU	119	1.979	4.88	6.06	3.71	0.88	1.20	1.10	1.49	0.67	0.91

TABLE G-II

95% CONFIDENCE LIMITS FOR MAXIMUM (R+M)/2, RON, AND MON REQUIREMENTS

1986 Select Models

Model	Fuel	n	t	Std.Dev. (s) (R+M)/2	95% Confidence Limits, (R+M)/2 50% Satis.	95% Confidence Limits, (R+M)/2 90% Satis.	Std.Dev. (s) RON	95% Confidence Limits, RON 50% Satis.	95% Confidence Limits, RON 90% Satis.	Std.Dev. (s) MON	95% Confidence Limits, MON 50% Satis.	95% Confidence Limits, MON 90% Satis.
PKD T22A3/KKD T22A3/	PR	14	2.16	2.7	1.5	2.1	2.7	1.5	2.1	2.7	1.5	2.1
KED T22A3/KHD T22A3/	FBRU	14	2.16	2.3	1.3	1.8	2.8	1.6	2.2	1.7	1.0	1.4
DCD T22A3	FBRSU	14	2.16	2.3	1.3	1.8	2.9	1.6	2.3	1.8	1.0	1.4
PKK T25A3/KKK T25A3/	PR	12	2.20	3.1	1.9	2.7	3.1	1.9	2.7	3.1	1.9	2.7
PEK T25A3/KHK T25A3	FBRU	12	2.20	2.2	1.4	1.9	2.8	1.8	2.4	1.6	1.0	1.4
	FBRSU	12	2.20	2.4	1.5	2.1	3.0	1.9	2.6	1.9	1.2	1.6
OPF P50A4/MPF P50A4	PR	11	2.23	3.2	2.1	2.9	3.2	2.1	2.9	3.2	2.1	2.9
OSF P50A4	FBRU	11	2.23	2.2	1.5	2.0	2.8	1.9	2.6	1.6	1.1	1.5
	FBRSU	11	2.23	2.1	1.4	1.9	2.6	1.7	2.4	1.5	1.0	1.4
ORU P30A4/MRU P30A4/	PR	17	2.12	4.0	2.1	2.8	4.0	2.1	2.8	4.0	2.1	2.8
ORU P30A3, Knock Sensor	FBRU	17	2.12	3.3	1.7	2.3	4.1	2.1	2.9	2.5	1.3	1.8
Maximum (High-Borderline)	FBRSU	17	2.12	3.3	1.7	2.3	4.0	2.1	2.8	2.6	1.4	1.8
ORU P30A4/MRU P30A4/	PR	14	2.16	3.6	2.1	2.8	3.6	2.1	2.8	3.6	2.1	2.8
URU P30A3, Knock Sensor	FBRU	14	2.16	1.9	1.1	1.5	2.3	1.3	1.8	1.5	0.8	1.2
Minimum (Low-Borderline)	FBRSU	14	2.16	2.1	1.2	1.6	2.5	1.4	2.0	1.6	0.9	1.3

TABLE G-II
(Continued)

95% CONFIDENCE LIMITS FOR MAXIMUM (R+M)/2, RON, AND MON REQUIREMENTS

1986 Select Models

Model	Fuel	n	t	Std.Dev. (s) (R+M)/2	95% Confidence Limits, (R+M)/2 50% Satis.	95% Confidence Limits, (R+M)/2 90% Satis.	Std.Dev. (s) RON	95% Confidence Limits, RON 50% Satis.	95% Confidence Limits, RON 90% Satis.	Std.Dev. (s) MON	95% Confidence Limits, MON 50% Satis.	95% Confidence Limits, MON 90% Satis.
HAR T25A3/HAR T25A3/	PR	28	2.05	3.7	1.4	1.9	3.7	1.4	1.9	3.7	1.4	1.9
IAR T25A3/LAR T25A3	FBRU	28	2.05	3.6	1.4	1.9	4.3	1.7	2.3	2.9	1.1	1.5
	FBRSU	28	2.05	3.7	1.4	1.9	4.2	1.6	2.2	3.1	1.2	1.6
ICB P38A4/IEB P38A4/	PR	16	2.13	4.7	2.5	3.4	4.7	2.5	3.4	4.7	2.5	3.4
LCB P38A4/LEB P38A4	FBRU	16	2.13	3.6	1.9	2.6	4.3	2.3	3.1	2.9	1.5	2.1
Knock Sensor	FBRSU	16	2.13	4.1	2.2	3.0	4.9	2.6	3.6	3.3	1.7	2.4
Maximum (High-Borderline)												
ICB P38A4/IEB P38A4/	PR	16	2.13	4.8	2.6	3.5	4.8	2.6	3.5	4.8	2.6	3.5
LCB P38A4/LEB P38A4	FBRU	16	2.13	3.8	2.0	2.8	4.5	2.4	3.3	3.2	1.7	2.3
Knock Sensor	FBRSU	16	2.13	4.4	2.3	3.2	5.1	2.7	3.7	3.6	1.9	2.6
Minimum (Low-Borderline)												

END
12-87
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